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VEGETATION AND SOILS OF THE CHURCHILL CANYON WATERSHED

WILBERT H. BLACKBURN

PAUL T. TUELLER

RICHARD E. ECKERT, JR.



AGRICULTURAL EXPERIMENT STATION
MAX C. FLEISCHMANN COLLEGE OF AGRICULTURE
UNIVERSITY OF NEVADA

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WATERSHED.

Wilbert H. Blackburn^{1/}, Paul T. Tyeller^{1/}.
and Richard E. Eckert, Jr.^{2/}

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^{1/}Junior Range Ecologist and Associate Range Ecologist,
Nevada Agric. Exp. Station, Reno.

^{2/}Range Scientist, Crops Research Division, Agricultural
Research Service, USDA, Reno

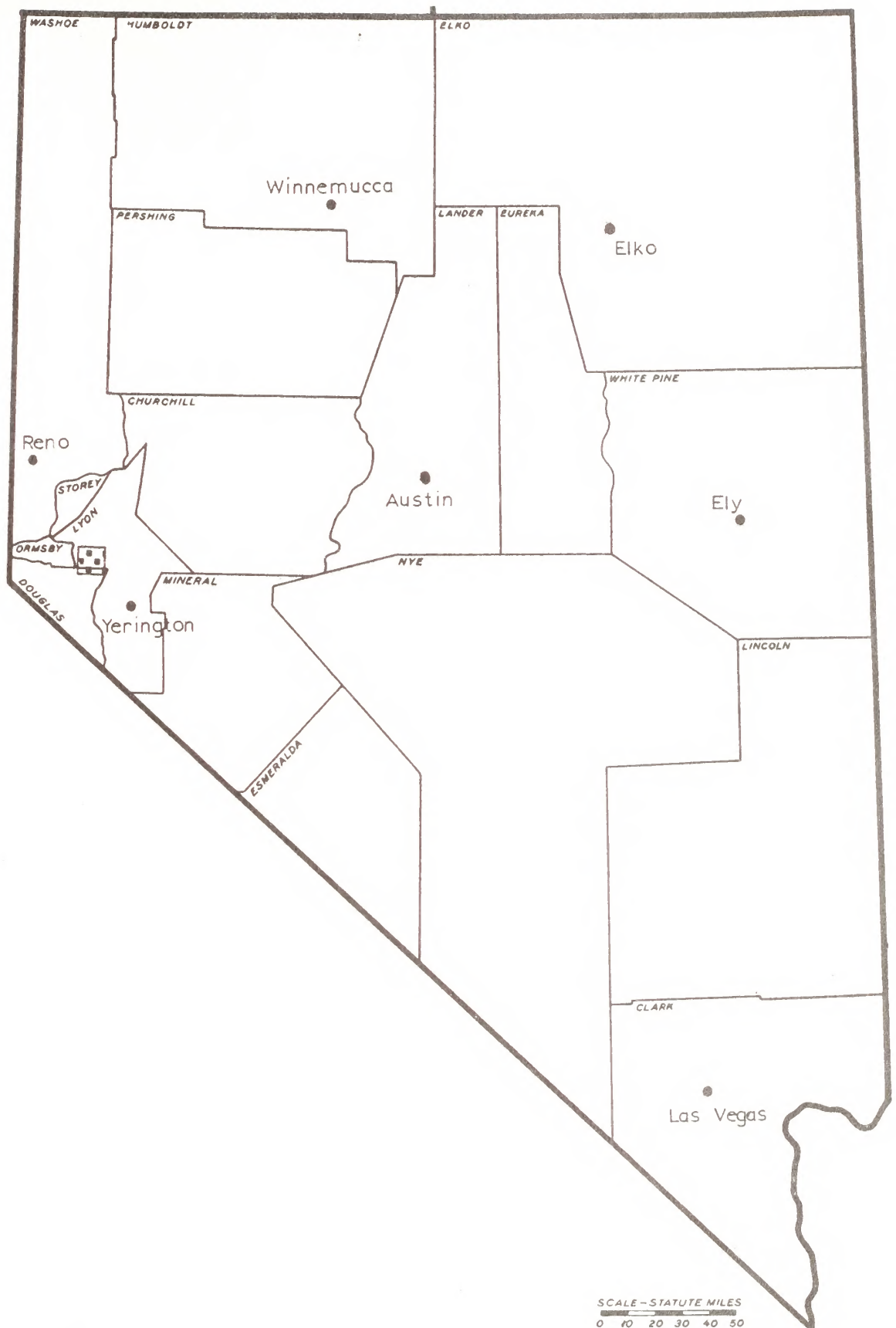


Figure 1.  Location of The Churchill Canyon Watershed in Nevada

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INTRODUCTION

The Churchill Canyon Watershed is located about 11 airline miles west and a little north of Yerington, Nevada, and is mostly in Lyon County with a small portion in Douglas County (Figure 1). The basin includes approximately 80 square miles.

The watershed lies in the western part of the Great Basin within the Basin and Range physiographic province and consists of north-south trending mountains separated by small valleys. The altitude of the highest peak is about 8400 feet and the basin outlet is approximately 4600 feet. Relief between the mountains and adjoining valleys rarely exceeds 2800 feet.

Geologic parent materials consist mainly of alluvium, granitic rocks, andesite and dacite with smaller amount of rhyolite tuff, meta-sedimentary rocks, and metavolcanic rocks (Moore, 1961).

Several intermittent streams are found in the basin, while ephemeral streams flow briefly following snow melt or thunderstorms. A number of perennial springs are found in the watershed.

The climate of the watershed is semiarid. Annual precipitation for a 4-year period (1963-1967) ranged from 5.8 to 14.4 inches. Comparisons with known records at Yerington indicated two above average, one near average and one much below average precipitation years. The approximate temperature at the lower elevations of the basin range from a low of -24°F to a high of 105°F with the average annual temperature of 50°F.

Three vegetative zones are represented in the watershed: salt desert shrub, northern desert shrub, and pinyon-juniper. Soils are mostly Aridisols and Mollisols with a few Entisols.

The watershed is used primarily for sheep winter range, to a lesser degree for cattle and sheep summer range, and as year-long range for big game and other wildlife.

Land managers constantly require factual information upon which to base their programs. There is a special need for detailed data concerning vegetation and soils on rangelands. Material included in this report describes the climax and seral units of vegetation and associated soils in the Churchill Canyon Watershed. It is one of 12 range watershed study areas in Nevada administered by the U. S. Department of the Interior, Bureau of Land Management. The vegetation-soil analysis herein reported is a portion of a cooperative research effort between the Bureau of Land Management and the Renewable Resources Center of the University of Nevada.

This study was designed as a multiple-purpose ecological inventory of vegetation and soil resources. The study provides fundamental information which can be interpreted and re-interpreted as use patterns change and as understanding increases without the need for a complete re-survey as new uses are emphasized.

The value of the data outlined in this report lies in the development of relationships between vegetation and soil and the resultant indicator significance of vegetation. For example, a classification of the basic ecological units is necessary for a thorough understanding of the landscape and for interpretation of site potential. However, site potential for a given vegetation-soil grouping requires further analysis and the accumulation of data about the value of a management practice if it were applied to the grouping in question. Much of this data is not yet available. Any management recommendation made in this report is curtailed due to a lack of data relating to vegetation-soil groupings described herein. When such data become available, however, the land manager will be able to easily identify sites within the confines of his unit of responsibility upon which a given practice or management program has been found desirable. An enhanced ability to precisely define range landscapes constitutes the real value of this analysis.

In this study we have attempted to define the vegetation-soil groupings on the basis of a habitat-type classification. A habitat-type, as defined by Daubenmire (1952) is "the collective area which is capable of supporting the same homogeneous climax plant association." Collective area means a unique ecological entity which can be delineated on a map or aerial photograph. The habitat-type concept indexes site potential since it is an expression of the ultimate unit of the sum environment with regard to vegetation, soil classification unit, topographic placement, and by inference micro- and mesoclimatic factors.

As an example, we have interpreted the *Atriplex confertifolia*/*Artemisia spinescens* community to be a habitat-type based on its homogeneity, recurrence, productivity, relict areas, and apparent equilibrium with its environment. When a community is not climax, careful evaluation of plant, soil, physiographic, and climatological data is necessary in order to speculate as to the probable habitat-type with its specific potential. The *Artemisia tridentata*/*Juncus balticus* community is an example of seral vegetation. Remnant *Carex* sp. and *Elymus triticoides* plants are found in this community which occurred in the same soil with the same physiographic placement and similar climate as *E. triticoides*/*Carex* sp. stands found elsewhere within the basin. On these bases, the *A. tridentata*/*J. balticus* community was interpreted to be an *E. triticoides*/*Carex* sp. habitat-type. Similar evaluations have been made for most of the communities recognized in the watershed.

The first section of this report is a dichotomous key to the 41 plant communities. This key refers the reader to the second section, a detailed description of each community. The third section is devoted to a discussion and management suitabilities for the watershed. This is followed by the appendices which consists of precipitation data, soil families and sub-groups as associated with the watershed plant communities, vegetation and soil association table. Finally, a map of the watershed illustrates mapping units which consists of plant communities with their respective percentage indicated; precipitation recording stations; roads; townships, ranges, and sections.

METHODOLOGY

The vegetation of the Churchill Canyon Watershed was delineated into plant communities during a reconnaissance. As a general rule, all communities were recognized and delineated on the basis of vegetative characteristics alone. Then as soil and physiographic data were accumulated, this initial delineation was re-evaluated on several occasions until the 41 plant communities described in this report were finally identified and interpreted. These communities were given names corresponding to the major dominant and major sub-dominant species.

Density and Crown Cover Data

Density (trees/acre) and crown cover of pinyon and juniper were obtained from a 66- x 132-foot plot using four maturity classes (Bradshaw and Reveal, 1943). Trees rooted in the study plot were counted by maturity class and density calculated. An average cover for each maturity class by species was used in calculating crown cover based on a n of 20.

Basal Area and Cover Data

After the plant communities were delineated, vegetation was analyzed by the point method (Levy and Madden, 1933) and by an adaptation of methods described by Poulton and Tisdale (1961) and further modified by Tueller (1962).

A 100-foot square macroplot was used. Five plots were considered ample to adequately describe a community (Eckert, 1957) but on minor or less accessible communities, only one or two plots were used.

Permanent macroplots were established by running a 100-foot baseline up and down the slope. Plots placed on the level were oriented north and south.

Within each macroplot, four 4- x 50-foot belt transects were randomly located perpendicular to the baseline. Randomization was restricted to prevent transect overlap and to provide for two transects each in the upper and lower half of the plots. This two-way randomization provides for adequate sampling of the full length of the macroplot (Eckert, 1957).

Each belt transect was divided into ten 4- x 5-foot plots, thus forty 4- x 5-foot plots were studied in each macroplot. Two kinds of data were obtained from each plot: (1) basal area of the more abundant grasses and herbs, and (2) crown cover estimates of shrubs. A one-square foot frame was used as an estimation guide for both basal area and crown cover data.

Basal area was selected because it is relatively free from yearly weather variations and grazing influences (Tueller, 1962). Dead centers which exceeded 25 percent of the area of bunchgrasses were excluded from the estimate. Basal area estimates by species were based on the following cover classes (Poulton, 1962):

<u>Class</u>	<u>Class Range Percent</u>	<u>Midpoint Percent</u>
1	0 - 1	0.5
2	1+ - 5	2.5
3	5+ - 10	7.5
4	10+ - 25	17.5
5	25+ - 50	37.5
6	50+ - 75	62.5
7	75+ - 95	85.0
8	95+ -100	97.5

The midpoint of each class range was used in calculating cover percentage.

Shrub crown cover estimates were obtained by standing directly over the shrub and projecting the foliage cover onto the ground. Estimates were made for each species to the nearest 1 percent of the 4- x 5-foot plot. Openings in the canopy larger than one-quarter of a square foot were not included.

Frequency data

Frequency, according to Cain and Castro (1959), is percent presence in plots of a stated size. For example, if a sample of a stand consists of 200 plots, and if one or more plants of a given species occurs in 50 of these plots, the species has a frequency percentage of 25.

Frequency sampling procedures developed by Hyder et al. (1963) were used to supplement cover estimates in each macroplot. Although frequency data are difficult to interpret, the speed and objectivity inherent in the method is useful for comparing areas where high statistical precision is needed (Tueller, 1962). Ten transects, each with 20 frequency determination quadrats, were located perpendicular to the baseline. Each transect consisted of twenty 20- x 20-inch, 10- x 10-inch, or 3- x 3-inch quadrats placed contiguously away from the baseline. Only those plants rooted inside the frequency quadrats were recorded. A two-stage randomization was applied to these transects: (1) restricting five transects to each half of the macroplot, and (2) preventing transect overlap.

Ground Cover Characteristics - Ground cover characteristics were determined by an adaptation of the point frame method as described by Goodall (1952). The same 200 frequency plots were used to sample cover but instead of recording presence of vegetation, the bottom tip end of the frequency frame was used as a point. Hits of bare ground, litter, pavement (1/4 to 1-inch diameter), rock (1-inch plus diameter), and vegetation were recorded.

Constancy - Cain and Castro (1959) define constancy as "the percentage of occurrence of a species on samples of the same size in various stands of a community type".

Species constancy was calculated for each macroplot. In order to develop a complete species list for constancy, each 100- x 100-square-foot macroplot was examined carefully after obtaining cover and frequency data. Additional species encountered were added to the list.

Topographic and Physiographic Features - Topographic features of each macroplot were characterized as follows: position on the slope whether top, upper one-third, center one-third, lower one-third, or bottom; slope in percent obtained from an abney level; and aspect from an 8-point compass.

Physiographic placement of each macroplot was characterized as follows: land form -- drainage bottom, escarpment, fan, floodplain, plateau, flooded depression, ridge top, slope, lake-marine, or river terrace; macrorelief -- flat, undulating, rolling, butte, hilly, or mountainous; microrelief -- uniform-flat, convex, concave; interrupted-mounts, pits, ridge, and swale.

Soil Study - A soil profile description was made at each macroplot using the procedures outlined in the Soil Survey Manual (1951) and the Seventh Approximation (1960) plus revisions (1967). Horizons, soil color, texture, pH, lime content, structure, and consistence were noted for each profile.

Lack of time and money prevented complete laboratory soil analyses. The following parameters were selected because they have been suggested to be indicative of vegetation and soil relationships (Eckert, 1957). Samples from the A1 and B2 horizons were analyzed for conductivity (millimhos per centimeter), pH (from a saturated paste), and organic matter (percent). Cation exchange capacity (milliequivalents per 100 grams) was determined only on those samples from the A1 horizon (USDA Handbook No. 60, 1954).

Family level identifications were made from the Seventh Approximation (1960) and revisions (1967). When more than one profile description per family occurred, the modal description was used for that family.

Each soil was classified as to hydrologic group (Nevada Dept. of Conservation and Natural Resources and the USDA, 1965); stoniness (USDA, 1951); and estimated water holding capacity based on clay mineralogy and texture (Schockley, 1955). Available waterholding capacity was estimated for the rooting depth or to the depth of the soil profile studied if not otherwise stated. Rooting depths were limited by duripans and lithic or paralithic contacts.

Soil boundaries were not physically located, and a soil map was not made. Thus detailed comparisons of soils across the boundary were not possible or within the scope of this study. Only the soils at the macroplots were described. The kinds of soils noted at the macroplots are commonly associated with the different kinds of vegetation in this watershed.

Climatic Data - Precipitation amounts were measured over a 4-year period from non-recording rain gages placed throughout the watershed. These data were then related to each applicable community in inches of annual precipitation.

Temperatures were estimated from existing records at Yerington located about 11 miles to the east. It has a climate similar to that of the lower elevations of the watershed.

Key to the Plant Communities
in the
Churchill Canyon Watershed

- A. Communities with a pigmy conifer overstory
 - B. Communities with a *P. monophylla* overstory
 - C. *P. monophylla* forming a closed community
..... *P. monophylla* Community (p.60)
 - CC. *A. tridentata* dominant in the shrub layer
..... *P. monophylla*/*A. tridentata* Community (p.62)
 - CCC. *S. vaccinioides* and *A. tridentata* sharing dominance
in the shrub layer.....*P. monophylla*/
S. vaccinioides/*A. tridentata* Community (p.65)
 - BB. Communities with a *P. monophylla*/*J. osteosperma* overstory
 - C. *A. arbuscula* dominant in the shrub layer
P. monophylla/*J. osteosperma*/*A. arbuscula* Community (p.68)
 - CC. *A. nova* dominant in the shrub layer
....*P. monophylla*/*J. osteosperma*/*A. nova* Community (p.71)
 - CCC. *A. nova* and *C. nauseosus* dominant in the shrub layer
..... *P. monophylla*/*J. osteosperma*/*A. nova*/
C. nauseosus Community..... (p.74)
 - CCCC. *A. tridentata* dominant in the shrub layer...*P. monophylla*/
J. osteosperma/*A. tridentata* Community..... (p.77)
- AA. Communities with a *Populus* overstory
 - B. *P. fremontii* and *Salix geyeriana* the dominant species
..... *P. fremontii*/*S. geyeriana* Community..... (p.79)
 - BB. *P. tremuloides* forming the overstory with *A. tridentata*
dominant in the shrub layer
.....*P. tremuloides*/*A. tridentata* Community..... (p.81)
- AAA. Communities not as above
 - B. Communities dominated by *Artemisia*
 - C. *A. arbuscula* overstory with *P. secunda* understory
..... *A. arbuscula*/*P. secunda* Community (p.10)
 - CC. *A. nova* overstory
 - D. *B. tectorum* the most frequent grass with less than
30 percent rock cover
..... *A. nova*/*B. tectorum* Community (p.12)
 - DD. *B. tectorum* the most frequent grass but with
30 percent or more rock cover
..... *A. nova*/*B. tectorum*/rock Community.... (p.14)

CCC. *A. tridentata* overstory

D. Grass or grasslike plant understory

E. *B. tectorum* the most frequent in the understory
and usually found at elevations below 5400 feet
....*A. tridentata*/*B. tectorum* (Low) Community (p.16)

EE. *B. tectorum* also the most frequent in the understory
but usually found at elevations above 5400 feet
...*A. tridentata*/*B. tectorum* (High) Community (p.18)

EEE. *J. balticus* and *Carex* species present in the under-
story...*A. tridentata*/*J. balticus* Community (p.28)

DD. Shrubs occurring as co-dominants or secondary dominants

E. *E. nevadensis* a co-dominant
.....*A. tridentata*/*E. nevadensis* Community (p.23)

EE. *G. spinosa* a co-dominant
..... *A. tridentata*/*G. spinosa* Community (p.25)

EEE. *D. polyadenia* a secondary dominant
..... *A. tridentata*/*D. polyadenia* Community (p.21)

EEEE. *S. vaccinioides* a secondary dominant
...*A. tridentata*/*S. vaccinioides* Community (p.32)

DDD. A high density of *P. monophylla* maturity class 1 and 2
.....*A. tridentata*/*P. monophylla* Community (p.30)

BB. Communities not dominated by *Artemisia* but with a shrub overstory

C. *A. confertifolia* overstory

D. *A. confertifolia* dominant in the overstory
.....*A. confertifolia* Community (p.34)

DD. *A. confertifolia* and *A. spinescens* co-dominant in the over-
story..*A. confertifolia*/*A. spinescens* Community (p.36)

CC. *Chrysothamnus* overstory

D. *C. nauseosus* dominant with *A. nova* and *B. tectorum* present
.....*C. nauseosus*/*A. nova*/*B. tectorum* Community (p.44)

DD. *C. viscidiflorus* dominant in the overstory
.....*C. viscidiflorus* Community (p.46)

- CCC. *G. spinosa* or *Ephedra nevadensis* overstory
- D. *G. spinosa* overstory
- E. *A. nova* and *S. speciosa* present
.....*G. spinosa*/*A. nova*/*S. speciosa* Community (p.56)
- EE. *G. spinosa* and *C. viscidiflorus* are co-dominants
.....*G. spinosa*/*C. viscidiflorus* Community (p.58)
- DD. *E. nevadensis* overstory
- E. *E. nevadensis* dominant in the overstory
..... *E. nevadensis* Community (p.50)
- EE. *E. nevadensis* dominant with *C. viscidiflorus* and
S. baileyi as sub-dominants*E. nevadensis*/
C. viscidiflorus/*S. baileyi* Community (p.52)
- DDD. Communities with a *Cerocarpus*, *Dalea* or *Eurotia* overstory
- E. *C. ledifolius* dominant with *A. tridentata* a sub-dominant
.....*C. ledifolius*/*A. tridentata* Community (p.42)
- EE. *D. polyadenia* dominant in the overstory
..... *D. polyadenia* Community (p.48)
- EEE. *E. lanata* dominant in the overstory
..... *E. lanata* Community (p.54)
- BBB. Communities without a shrub overstory
- C. *B. tectorum* present as a result of a burn
.....*B. tectorum* Community (p.38)
- C. *Carex* species and *J. balticus* dominant
.....*Carex* sp./*J. balticus* Community (p.40)

Artemisia arbuscula/*Poa secunda* Community

This community is usually located at or near the top of the mountains in the western part of the watershed. The *Artemisia tridentata*/*Symphoricarpos vaccinioides* or *Pinus monophylla*/*S. vaccinioides*/*A. tridentata* are usually found at lower elevations and *Cercocarpus ledifolius*/*A. tridentata* occurs as inclusions within the *A. arbuscula*/*P. secunda* community.

The mean annual precipitation for this community is 13.9 inches (Appendix A). Elevation is around 7600 feet. The community occurs on east, northeast, and west facing slopes of 5 percent or more.

Low sagebrush (*A. arbuscula*) is the dominant species with an average of 12.3 percent cover and 98.0 percent frequency. Sandberg bluegrass (*P. secunda*) is the most abundant grass (78.0 percent frequency) and squirreltail (*Sitanion hystrix*) occurs with 31.5 percent frequency. Fleabane (*Erigeron peucephyllus*), *Phlox* sp. and longleaf phlox (*Phlox longifolia*) are the most frequent forbs (37.5 percent, 31.5 percent, and 23.5 percent, respectively) (Table 1). This community is probably an *A. arbuscula*/*Festuca idahoensis* habitat-type.

Pavement accounts for 43.5 percent of the ground cover characteristics, vegetation for 36.5 percent, rock for 13.5 percent, litter for 6.0 percent, and bare ground for 0.5 percent (Table 2).

The soil at the macroplot where this community was sampled is a member of a very fine, mixed, frigid family of Lithic Argixerolls (Appendix B-35).

Table 1. Species Cover and Frequency for the
Artemisia arbuscula/*Poa secunda*
 Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Artemisia arbuscula</i>	12.3	98.0
<i>Poa secunda</i>		78.0
<i>Sitanion hystrix</i>		31.5
<i>Erigeron peucephyllus</i>		37.5
<i>Phlox</i> sp.		31.5
<i>Phlox longifolia</i>		23.5
<i>Lewisia rediviva</i>		6.0
<i>Astragalus</i> sp.		3.5

*Frame size in inches

Table 2. Ground Cover Characteristics for the
Artemisia arbuscula/*Poa secunda* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	0.5
Litter	6.0
Pavement	43.5
Rock	13.5
Vegetation	36.5

Black sagebrush (*Artemisia nova*) Communities

1. *Artemisia nova*/*Bromus tectorum* Community

This community occurs mostly in the central and northwestern part of the watershed. It is usually bounded by *A. nova*/*B. tectorum*/rock community at lower elevations and at higher elevations by *Pinus monophylla*/*Juniperus osteosperma*/*A. nova* Community.

The mean annual precipitation for this community is 9.2 inches (Appendix A). Elevation is from 4900 to 6400 feet. It occurs on north, northeast and east facing fans with 1 to 2 percent slopes.

Black sagebrush (*A. nova*) is the dominant shrub with 11.2 percent cover and 81.0 percent frequency. Mormon tea (*Ephedra nevadensis*) occurs sporadically (33 percent constancy).

Cheatgrass (*B. tectorum*) is the most frequent grass with 55.8 percent, however, squirreltail (*Sitanion hystrix*) is fairly frequent (17.8 percent). Indian ricegrass (*Oryzopsis hymenoides*) and Sandberg bluegrass occur in small amounts with 33 percent constancy). *Eriastrum diffusum* and fleabane (*Erigeron peucephyllus*) are the most frequent forbs with 44.1 percent and 25.8 percent, respectively. A variety of other forbs occur with varied frequency and constancy (Table 3). This community is probably an *A. nova*/*O. hymenoides* habitat-type.

Vegetation accounts for 25.3 percent of the ground cover characteristics, bareground for 24.6 percent, litter for 19.5 percent, pavement for 17.8 percent, and rock for 12.9 percent (Table 4).

The soil at the macroplots where this community was described is a member of a very-fine, mixed, frigid family of Mollic Durargids (Appendix B-25).

Table 3. Species Cover, Frequency, and Constancy
for the *Artemisia nova/Bromus tectorum*
Community

Species	Cover %	20 x 20* Frequency %	Constancy %
<i>Artemisia nova</i>	11.2	81.0	100
<i>Ephedra nevadensis</i>			33
<i>Bromus tectorum</i>		55.8	100
<i>Sitanion hystrix</i>		17.8	100
<i>Oryzopsis hymenoides</i>			33
<i>Poa secunda</i>			33
<i>Eriastrum diffusum</i>		44.1	100
<i>Erigeron peucephyllus</i>		25.8	67
<i>Eriogonum</i> sp.		18.2	33
<i>Cordylanthus ramosus</i>		14.8	33
<i>Eriogonum thomasi</i>		11.0	33
<i>Machaeranthera canescens</i>		7.0	33
<i>Gayophytum ramosissimum</i>		2.8	33
<i>Antennaria dimorpha</i>			67
<i>Calochortus nuttallii</i>			67
<i>Eriogonum densum</i>			33

*Frame size in inches

Table 4. Ground Cover Characteristics for the
Artemisia nova/Bromus tectorum Community

Material	Cover %
Bare ground	24.6
Litter	19.5
Pavement	17.8
Rock	12.8
Vegetation	25.3

2. *Artemisia nova*/*Bromus tectorum*/rock Community

This community has developed at the lower elevations on rocky hills, mostly in the southeast and northern parts of the watershed.

The mean annual precipitation for this community is 7.6 inches (Appendix A). Elevation is from 5025 feet to 5625 feet. The community occurs on slopes of 15 to 44 percent of all aspects.

Black sagebrush (*A. nova*) is the dominant shrub with 9.5 percent cover and 68.8 percent frequency. Yellowbrush (*Chrysothamnus viscidiflorus*) and spiny hopsage (*Grayia spinosa*) when present, occur in lesser amounts (6.9 and 5.6 percent frequency). When other shrubs are present, they are found in small quantities.

Cheatgrass (*B. tectorum*) and squirreltail (*Sitanion hystrix*) occurred in all study plots (100 percent constancy) with 46.9 and 11.9 percent frequency, respectively. A variety of other grasses occur in trace amounts with 25 percent constancy.

Groundsmoke (*Gayophytum ramosissimum*) and *Eriogonum densum* are the most frequent and constant forbs with 38.1 and 23.9 percent frequency and 100 and 75 percent constancy. A number of other forbs occur with smaller frequency and constancy values (Table 5). This community is probably an *A. nova*/*O. hymenoides* habitat-type.

Rock accounts for 35.4 percent of the ground cover characteristics, pavement for 29.4 percent, vegetation for 22.7 percent, bare ground for 6.9 percent, and litter for 5.6 percent (Table 6).

The soils at the macroplots where this community was described are members of a clayey-skeletal, mixed, frigid family of Mollic Haplargids (Appendix B-14); fine, mixed frigid family of Mollic Haplargids (Appendix B-15); or fine, mixed, frigid family of Mollic Nadurargids (Appendix B-29).

Table 5. Species Cover, Frequency, and Constancy for the
Artemisia nova/Bromus tectorum/rock Community

Species	Cover %	20 x 20* Frequency %	Constancy %
<i>Artemisia nova</i>	9.5	68.8	100
<i>Chrysothamnus viscidiflorus</i>		6.9	50
<i>Grayia spinosa</i>		5.5	50
<i>Ephedra nevadensis</i>			50
<i>Symphoricarpos</i> sp.			25
<i>Bromus tectorum</i>		46.9	100
<i>Sitanion hystrix</i>		11.9	100
<i>Festuca octoflora</i>			25
<i>Muhlenbergia richardsonis</i>			25
<i>Oryzopsis hymenoides</i>			25
<i>Poa secunda</i>			25
<i>Stipa speciosa</i>			25
<i>Gayophytum ramosissimum</i>		38.1	100
<i>Eriogonum densum</i>		23.9	75
<i>Lappula redowskii</i>		10.2	25
<i>Erodium cicutarium</i>		9.6	25
<i>Phlox longifolia</i>		3.8	25
<i>Eriogeron pumilis</i>		3.1	50
<i>Arabis holboellii</i>			25
<i>Calochortus nuttallii</i>			25
<i>Oenothera contorta</i>			25

*Frame size in inches

Table 6. Ground Cover Characteristics for the
Artemisia nova/Bromus tectorum/rock
Community

Material	Cover %
Bare ground	6.9
Litter	5.6
Pavement	29.4
Rock	35.4
Vegetation	22.7

Big Sagebrush (*Artemisia tridentata*) Communities

1. *Artemisia tridentata*/Bromus tectorum (Low) Community

This community is located in the northern part of the watershed at lower elevations. It is bounded on the east by *Artemisia tridentata*/*Dalea polyadenia*, *Atriplex confertifolia* and *Sarcobatus baileyi*/*A. confertifolia* communities. On the south, however, the *Artemisia nova*/*Bromus tectorum* /rock community is found.

The mean annual precipitation for this community is 6.8 inches (Appendix A). Elevation is from 4590 to 5300 feet. The community occurs on east, southeast and northeast facing slopes of 7 to 27 percent.

Big sagebrush (*A. tridentata*) is always present and is the dominant species with an average cover of 6.2 percent and 53.0 percent frequency. Mormon tea (*Ephedra nevadensis*) and spiny hopsage (*Grayia spinosa*) occur in most stands (75 percent constancy) in very small amounts. A number of other shrubs occur in small erratic (25 to 50 percent constancy) quantities.

Cheatgrass (*Bromus tectorum*) is the most frequent grass with an average of 46.5 percent frequency. Mat muhly (*Muhlenbergia richardsonis*) and squirreltail (*Sitanion hystrix*) occur less frequently with 13.1 and 7.2 percent, respectively. Cheatgrass, squirreltail and Indian ricegrass (*Oryzopsis hymenoides*) occurred in all stands sampled. Mat muhly occurred in 75 percent of the stands and other grasses occurred only in trace amounts in 25 percent of the stands.

Erastrum diffusum and annual stickseed (*Lappula redowskii*) are the most frequent forbs with an average 40.5 and 24.0 percent frequency, respectively. *Navarretia* sp., fixweed tansymustard (*Descurainia sophia*), *Eriogonum densum*, desert mentzelia (*Mentzelia multiflora*) and ground-smoke (*Gaylophytum ramosissimum*) occur with small frequency values (12.9 and 5.6 percent) but each have a constancy rating of 75 percent or more. Other forbs occur in trace amounts with constancy ratings of 50 percent or less (Table 7). This community is probably an *A. tridentata*/*O. hymenoides* habitat-type.

Rock accounts for 44.1 percent of the ground cover characteristics, pavement for 28.4 percent, vegetation for 14.9 percent, litter for 8.4 percent, and bare ground for 4.1 percent (Table 8).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, mesic family of Typic Haplargids (Appendix B-5); clayey-skeletal, mixed, mesic family of Lithic Mollic Haplargids (Appendix B-11); or fine, mixed, mesic family of Typic Durargids (Appendix B-19).

Table 7. Species Cover, Frequency and Constancy
for the *Artemisia tridentata*/*Bromus*
tectorum (Low) Community

Species	Cover %	20 x 20* Frequency %	Constancy %
<i>Artemisia tridentata</i>	6.2	53.0	100
<i>Ephedra nevadensis</i>			75
<i>Grayia spinosa</i>			75
<i>Tetradymia glabrata</i>			50
<i>Atriplex canescens</i>			25
<i>Eurotia lanata</i>			25
<i>Sarcobatus baileyi</i>			25
<i>Bromus tectorum</i>		46.5	100
<i>Muhlenbergia richardsonis</i>		13.1	75
<i>Sitanion hystrix</i>		7.2	100
<i>Oryzopsis hymenoides</i>			100
<i>Festuca octoflora</i>			25
<i>Hilaria jamesii</i>			25
<i>Stipa speciosa</i>			25
<i>Eriastrum diffusum</i>		40.5	100
<i>Lappula redowskii</i>		24.0	75
<i>Navarretia</i> sp.		12.9	75
<i>Decurainia sophia</i>		7.4	100
<i>Eriogonum densum</i>		7.4	100
<i>Mentzelia multiflora</i>		6.0	75
<i>Gayophytum ramosissimum</i>		5.6	75
<i>Erigeron pumilis</i>			50
<i>Amsinckia menziesii</i>			25
<i>Astragalus</i> sp.			25
<i>Happlopappus acaulis</i>			25
<i>Oenothera contorta</i>			25
<i>Sphaeralcea coccinea</i>			25
<i>Zigadenus paniculatus</i>			25

* Frame size in inches

Table 8. Ground Cover Characteristics for the
Artemisia tridentata/Bromus tectorum
(Low) Community

<u>Material</u>	<u>Cover %</u>
Bare ground	4.1
Litter	8.4
Pavement	28.4
Rock	44.1
Vegetation	14.8

2. *Artemisia tridentata/Bromus tectorum* (High) Community

This community has developed in the southern part of the watershed. It is bounded by the *Artemisia tridentata/Ephedra nevadensis* community on the east, the *Pinus monophylla/Juniperus osteosperma/A. tridentata* and *Artemisia nova/Bromus tectorum/rock* communities on the north, south and east. There are several inclusions of the *Carex sp./Juncus balticus* community within this community.

The mean annual precipitation for this community is 11.2 inches (Appendix A). Elevation is from 5100 to 5600 feet. The community is found on east or northeast facing fans with 1 to 6 percent slopes.

Big sagebrush (*A. tridentata*) is always present and is the dominant species with 15.3 percent cover and 59.5 percent frequency. Anderson peachbrush (*Prunus andersonii*), snowberry (*Symphoricarpos vaccinioides*), and gray horsebrush (*Tetradymia conescens*) occur in trace amounts with 50 percent constancy.

Cheatgrass (*B. tectorum*) is the most abundant grass in the community with 38.0 percent frequency. Squirreltail (*Sitanion hystrix*) occurs with 19.5 percent frequency. Both cheatgrass and squirreltail have a constancy rating of 100 percent. Indian ricegrass (*Oryzopsis hymenoides*) and Thurbers needlegrass (*Stipa thurberiana*) have constancy values of 50 percent.

Eriastrum diffusum, groundsmoke (*Gaylophytum ramosissimum*) and skeletonweed (*Iygodesmia spinosa*) occur with 38.8, 32.2 and 21.5 percent frequency, respectively. Groundsmoke and skeletonweed have a constancy of 50 percent, while *E. diffusum* and *Oenothera contorta* have a 100 percent constancy. *O. contorta* occurs with 3.0 percent frequency. A variety of other forbs, when present, occur in small quantities (Table 9). This community is probably an *A. tridentata/Stipa thurberiana* habitat-type.

Pavement accounts for 38.8 percent of the ground cover characteristics, vegetation for 29.5 percent, litter for 22.2 percent, and bare ground for 9.5 percent (Table 10).

The soils at the macroplots where the community was sampled are members of a fine-loamy, mixed, frigid family of Mollic Haplargids (Appendix B-13), or fine-loamy, mixed frigid family of Typic Argixerolls (Appendix B-33).

Table 9. Species Cover, Frequency and Constancy
for the *Artemisia tridentata*/*Bromus*
tectorum (High) Community

Species	Cover %	Frequency %	Constancy %
<i>Artemisia tridentata</i>	15.3	58.5	100
<i>Prunus andersonii</i>			50
<i>Symphoricarpos vaccinioides</i>			50
<i>Tetradymia canescens</i>			50
<i>Bromus tectorum</i>		38.0	100
<i>Sitanion hystrix</i>		19.5	100
<i>Oryzopsis hymenoides</i>			50
<i>Stipa thurberiana</i>			50
<i>Eriastrum diffusum</i>		38.8	50
<i>Gayophytum ramosissimum</i>		32.2	100
<i>Lygodesmia spinosa</i>		21.5	50
<i>Mentzelia multiflora</i>		7.2	50
<i>Calochortus nuttallii</i>		5.6	50
<i>Oenothera contorta</i>		3.0	100
<i>Navarretia</i> sp.		2.5	50
<i>Astragalus</i> spp.		2.2	50
<i>Phlox longifolia</i>		2.0	50
<i>Arabis holboellii</i>			50
<i>Erigeron pumilis</i>			50
<i>Eriogonum thomasi</i>			50
<i>Phacelia</i> sp.			50
<i>Sphaeralcea coccinea</i>			50

Table 10. Ground Cover Characteristics for the
Artemisia tridentata/Bromus tectorum
(High) Community

<u>Material</u>	<u>Cover %</u>
Bare ground	9.5
Litter	22.2
Pavement	38.8
Rock	-
Vegetation	29.5

3. *Artemisia tridentata/Dalea polyadenia* Community

This community is found in the northern end of the watershed. The *A. tridentata/Ephedra nevadensis* community is found on the south; the *Sarcobatus baileyi/Atriplex confertifolia* or *A. tridentata/Bromus tectorum* (Low) communities on the west; and the *Tetradymia glabrata/Chrysothamnus viscidiflorus* or *A. tridentata/Grayia spinosa* communities on the east.

The mean annual precipitation for this community is 6.8 inches (Appendix A). Elevation is around 4610 feet. The community is found on west facing drainage bottoms with 1 percent slopes.

Big sagebrush (*A. tridentata*) is the dominant species with 6.8 percent cover and 27.5 percent frequency. Nevada dalea (*Dalea polyadenia*) and yellowbrush (*Chrysothamnus viscidiflorus*) occur as secondary dominants with 2.2 and 2.1 percent cover, and 13.0 and 16.0 percent frequency, respectively. Other shrubs such as Mormon tea (*Ephedra nevadensis*), winterfat (*Eurotia lanata*) and spiny hopsage (*Grayia spinosa*) are present in small quantities.

Cheatgrass (*Bromus tectorum*), squirreltail (*Sitanion hystrix*) and Indian ricegrass (*Oryzopsis hymenoides*) occur with small frequency of 7.5, 7.0 and 3.0 percent, respectively. Galleta (*Hilaria jamesii*) is found in trace amounts.

Eriastrum diffusum is the most frequent forb species in the community with 76.5 percent. *Eriogonum densum*, *Mentzelia multiflora*, *Phacelia* sp. and *Navarretia* sp. occur with 31.5, 24.0, 15.5 and 15.5 percent frequency, respectively. A few additional forbs occur in the community but contribute little to frequency percentage (Table 11). This community is probably a *Dalea polyadenia/Oryzopsis hymenoides* habitat-type.

Bare ground accounts for 62.0 percent of the ground cover characteristics, litter for 16.5 percent, vegetation for 12.0 percent, pavement for 8.0 percent, and rock for 1.5 percent (Table 12).

The soil at the macroplot where this community was sampled is a member of a sandy, mixed, mesic family of Typic Torripsamments (Appendix B-1).

Table 11. Species Cover and Frequency for the
Artemisia tridentata/Dalea polyadenia
 Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Artemisia tridentata</i>	6.8	27.5
<i>Dalea polyadenia</i>	2.2	13.0
<i>Chrysothamnus viscidiflorus</i>	2.1	16.0
<i>Ephedra nevadensis</i>		4.0
<i>Eurotia lanata</i>		t**
<i>Grayia spinosa</i>		t
<i>Bromus tectorum</i>		7.5
<i>Sitanion hystrix</i>		7.0
<i>Oryzopsis hymenoides</i>		3.0
<i>Hilaria jamesii</i>		t
<i>Eriastrum diffusum</i>		76.5
<i>Eriogonum densum</i>		31.5
<i>Mentzelia multiflora</i>		24.0
<i>Phacelia</i>		15.5
<i>Navarretia</i>		15.5
<i>Descurainia sophia</i>		t
<i>Sphaeralcea coccinea</i>		t

* Frame size in inches
 ** Trace

Table 12. Ground Cover Characteristics for the
Artemisia tridentata/Dalea polyadenia
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	6.20
Litter	16.5
Pavement	8.0
Rock	1.5
Vegetation	12.0

4. *Artemisia tridentata*/*Ephedra nevadensis* Community

This community is located in the main drainage on the north and south of the *E. nevadensis* community. As elevation increases, *A. tridentata*/*E. nevadensis*, on either side of the drainage, changes to a number of different communities.

The mean annual precipitation for this community is 6.6 inches (Appendix A). Elevation is 4630 to 5000 feet. The community is found on northwest, northeast, and east facing drainage bottoms with 1 to 2 percent slopes.

Big sagebrush (*A. tridentata*) and Mormon tea (*E. nevadensis*) are always present (100 percent constancy) and dominate the shrub and ground layers with 7.7 and 5.6 percent cover and 17.4 and 21.6 percent frequency, respectively. A number of other shrubs, when present, occur in small amounts.

Cheatgrass (*Bromus tectorum*) is found in all stands with an average frequency of 4.8 percent. Squirreltail (*Sitanion hystrix*) and Indian ricegrass (*Oryzopsis hymenoides*) have a constancy of 75 percent and a frequency of 2 percent or less.

Navarretia sp. and *Mentzelia multiflora* occur in all stands with a 31.6 and 22.8 percent frequency, respectively. *Eriastrum diffusum*, *Phacelia* sp. and *Gayophytum ramosissimum* have a constancy of 75 percent and frequency of 17.1, 12.6, and 9.8 percent, respectively. A large variety of other forbs occur with 75 to 25 percent constancy and 5.0 percent or less frequency (Table 13). This community is probably an *A. tridentata*/*E. nevadensis*/*O. hymenoides* habitat-type.

Bare ground accounts for 51.6 percent of the ground cover characteristics, vegetation for 21.3 percent, litter for 18.4 percent, pavement for 8.2 percent, and rock for 0.5 percent (Table 14).

The soil at the macroplots where this community was sampled is a member of a sandy, mixed, mesic family of Typic Torripsamments (Appendix B-1).

Table 13. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Ephedra nevadensis* Community

Species	Cover %	20 x 20*	Constancy %
		Frequency %	
<i>Artemisia tridentata</i>	7.7	17.4	100
<i>Ephedra nevadensis</i>	5.6	21.6	100
<i>Grayia spinosa</i>			50
<i>Atriplex canescens</i>			25
<i>Chrysothamnus nauseosus</i>			25
<i>Chrysothamnus viscidiflorus</i>			25
<i>Prunus andersonii</i>			25
<i>Tetradymia glabrata</i>			25
<i>Bromus tectorum</i>		4.8	100
<i>Sitanion hystrix</i>		2.0	75
<i>Oryzopsis hymenoides</i>			75
<i>Navarretia</i> sp.		31.6	100
<i>Mentzelia multiflora</i>		22.8	100
<i>Erisatrum diffusum</i>		17.1	75
<i>Phacelia</i> sp.		12.6	75
<i>Gayophytum ramosissimum</i>		9.8	75
<i>Eriogonum thomasi</i>		5.0	75
<i>Boraginaceae</i> sp.		3.9	25
<i>Oenothera multijuga</i>		3.5	25
<i>Microsteris</i> sp.		3.4	25
<i>Oenothera contorta</i>		3.3	25
<i>Amsinckia menziesii</i>		3.0	75
<i>Cleome lutea</i>			50
<i>Descurainia sophia</i>			50
<i>Eriogonum densum</i>			50
<i>Oenothera</i> sp.			50
<i>Astragalus</i> spp.			25
<i>Chaenactis douglasii</i>			25
<i>Erodium cicutarium</i>			25
<i>Lappula redowskii</i>			25
<i>Sphaeralcea coccinea</i>			25

* Frame size in inches

Table 14. Ground Cover Characteristics for the
Artemisia tridentata/*Ephedra nevadensis*
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	51.6
Litter	18.4
Pavement	8.2
Rock	0.5
Vegetation	21.3

5. *Artemisia tridentata*/*Grayia spinosa* Community

This community has developed in the northern and eastern part of the watershed. In the northern part it is bounded by *A. tridentata*/*D. polyadenia* on the west, *A. tridentata*/*E. nevadensis* on the south, *Atriplex confertifolia*/*Artemisia spinescens* on the east, and by *Chrysothamnus viscidiflorus* on the north. In the eastern part of the watershed, however, the *A. tridentata*/*G. spinosa* community is bounded by *A. nova*/*B. tectorum*/rock on the southwest and northwest, *A. tridentata*/*E. nevadensis* on the northeast, and *G. spinosa*/*C. viscidiflorus* on the south.

The mean annual precipitation for this community is 6.9 inches (Appendix A). Elevation ranges from 4660 to 4900 feet. The community is found on west and northeast facing slopes of 1 to 46 percent.

Big sagebrush (*A. tridentata*) and spiny hopsage (*G. spinosa*) are the dominant species in the community with an average cover of 8.0 and 2.6 percent and frequency of 34.0 and 16.5 percent, respectively. Yellowbrush (*C. viscidiflorus*) and winterfat (*Eurotia lanata*) occur in all stands in trace amounts. A variety of other shrubs have low constancy and frequency values.

Cheatgrass (*Bromus tectorum*) and Indian ricegrass (*Oryzopsis hymenoides*) have 100 percent constancy and 18.5 and 5.5 percent frequency, respectively. Squirreltail (*Sitanion hystrix*) and desert needlegrass (*Stipa speciosa*) occur in one-half of the stands with 4.0 percent frequency or less.

The forbs occur with varied frequency and constancy throughout the community. *Mentzelia multiflora*, *Descurainia sophia*, *Navarretia* sp. and *Eriastrum diffusum* are present in all stands with 18.2, 8.6, 5.2, and 2.0 percent frequency, respectively (Table 15). This community is probably an *A. tridentata*/*G. spinosa*/*O. hymenoides* habitat-type.

Pavement accounts for 35.9 percent of the ground cover characteristics, rock for 23.5 percent, vegetation for 19.2 percent, litter for 15.5 percent, and bare ground for 6.0 percent (Table 16).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-3); or loamy-skeletal, mixed, mesic family of Lithic Haplargids (Appendix B-8).

Table 15. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Grayia spinosa* Community

Species	Cover %	20 x 20*	Constancy %
		Frequency %	
<i>Artemisia tridentata</i>	8.0	34.0	100
<i>Grayia spinosa</i>	2.6	16.5	100
<i>Chrysothamnus viscidiflorus</i>			100
<i>Eurotia lanata</i>			100
<i>Atriplex confertifolia</i>			50
<i>Dalea polyadenia</i>			50
<i>Ephedra nevadensis</i>			50
<i>Tetradymia glabrata</i>			50
<i>Bromus tectorum</i>		18.5	100
<i>Oryzopsis hymenoides</i>		6.5	100
<i>Sitanion hystrix</i>		4.0	50
<i>Stipa speciosa</i>			50
<i>Mentzelia multiflora</i>		18.2	100
<i>Descurainia sophia</i>		8.6	100
<i>Eriogonum densum</i>		5.5	50
<i>Navarretia</i> sp.		5.2	100
<i>Oenothera contorta</i>		2.8	50
<i>Eriastrum diffusum</i>		2.0	100
<i>Amsinckia menziesii</i>			50
<i>Astragalus</i> sp.			50
<i>Gayophytum ramosissimum</i>			50
<i>Lappula redowskii</i>			50
<i>Sphaeralcea coccinea</i>			50

*Frame size in inches

Table 16. Ground Cover Characteristics for the
Artemisia tridentata/*Grayia spinosa*
Community

Material	Cover %
Bare ground	6.0
Litter	15.5
Pavement	35.8
Rock	23.5
Vegetation	19.2

6. *Artemisia tridentata*/*Juncus balticus* Community

This community is found in the southern part of the watershed. It is bordered by *A. nova*/*B. tectorum*/rock on the southeast and north; *A. tridentata*/*B. tectorum* (High) and *Pinus monophylla*/*A. tridentata* on the east. The *Carex* sp./*J. balticus* community is usually found as inclusions within the *A. tridentata*/*J. balticus* community.

The mean annual precipitation for this community is 11.2 inches (Appendix A). Elevation is around 5400 feet. The community is found on northeast facing slopes of 4 percent.

Big sagebrush (*A. tridentata*) is the dominant species with an average cover of 32.2 percent and frequency of 87.0 percent. Woods rose (*Rosa woodsii*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and gray horsebrush (*Tetradymia canescens*) are usually present in the community but in small amounts.

Baltic rush (*J. balticus*) and sedge (*Carex* sp.) occur with 15.0 and 6.0 percent frequency, respectively. Squirreltail (*Sitanion hystrix*) is the most frequent (27.0 percent) grass. Cheatgrass (*B. tectorum*), Thurber's needlegrass (*Stipa thurberiana*) and Great Basin wildrye (*Elymus cinereus*) occur with 10.0, 5.5, and 2.0 percent frequency, respectively.

Tailcup lupine (*Lupinus caudatus*) is the most abundant forb (6.0 percent). Other forbs are present only in small quantities (Table 17). This community is a degraded meadow and is probably an *Elymus triticoides*/*Carex* sp. habitat-type.

Vegetation accounts for 55.5 percent of the ground cover characteristics, litter for 24.0 percent, pavement for 16.5 percent, and bare ground for 4.0 percent (Table 18).

The soil at the macroplot where this community was sampled is a member of a loamy-skeletal, mixed, mesic family of Fluventic Haplaquolls (Appendix B-30).

Table 17. Species Cover and Frequency for the
Artemisia tridentata/Juncus balticus
Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Artemisia tridentata</i>	32.2	87.0
<i>Rosa woodsii</i>		2.0
<i>Chrysothamnus nauseosus</i>		t**
<i>Tetradymia canescens</i>		t
<i>Juncus balticus</i>		15.0
<i>Carex</i> sp.		6.0
<i>Sitanion hystrix</i>		27.0
<i>Bromus tectorum</i>		10.0
<i>Stipa thurberiana</i>		5.5
<i>Elymus cinereus</i>		2.0
<i>Lupinus caudatus</i>		6.0
<i>Eriastrum diffusum</i>		2.5
<i>Iva axillaris</i>		2.0
<i>Arabis holboellii</i>		t
<i>Astragalus</i> sp.		t
<i>Calochortus nuttallii</i>		t

*Frame size in inches

**Trace

Table 18. Ground Cover Characteristics for the
Artemisia tridentata/Juncus balticus
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	4.0
Litter	24.0
Pavement	16.5
Rock	-
Vegetation	55.5

7. *Artemisia tridentata*/*Pinus monophylla* Community

This community occurs in the western part of the watershed. It is bordered by the *P. monophylla* community on the northwest; *P. monophylla*/*A. tridentata* or *P. monophylla*/*Juniperus osteosperma*/*A. tridentata* community on the north and south; and by the *A. tridentata*/*Symphoricarpos vaccinioides* community on the west.

The mean annual precipitation for this community is 14.4 inches (Appendix A). Elevation is around 6180 feet. The community is found on northeast facing slopes of 3 percent.

Before this community was burned, it was a *P. monophylla*/*A. tridentata* community. Big sagebrush (*A. tridentata*) was released as a result of the burn, and now is the dominant species with 22.4 percent cover and 88.5 percent frequency. However, pinyon (*P. monophylla*) is re-establishing itself and will eventually dominate the community again. Small young pinyon trees, maturity class 1 and 2, occur with a density of 342.5 and 20.0 trees/acre and a cover of 4.3 and 2.0 percent, respectively. Anderson peachbrush (*Prunus andersonii*), antelope bitterbrush (*Purshia tridentata*) and golden currant (*Ribes aureum*) are usually present in small amounts.

Crested wheatgrass (*Agropyron desertorum*) occurs with 2.5 percent frequency. Cheatgrass (*Bromus tectorum*) and Indian ricegrass (*Oryzopsis hymenoides*) are usually found in the community.

Microsteris sp. is the most frequent forb with 17.0 percent. Skeletonweed (*Lygodesmia spinosa*) and foothill deathcamas (*Zigadenus paniculatus*) are usually present with low frequency values (Table 19). This community is a *P. monophylla*/*A. tridentata*/*O. hymenoides* habitat-type.

Vegetation accounts for 59.0 percent of the ground cover characteristics, litter for 25.0 percent, pavement for 12.0 percent, and bare ground for 4.0 percent (Table 20).

The soil at the macroplot where this community was sampled is a member of a fine, mixed, frigid family of Typic Argixerolls (Appendix B-34).

Table 19. Species Cover, Frequency and Density for the
Artemisia tridentata/*Pinus monophylla* Community

Species	Mean Density (trees/acre) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	342.5	20.0	-	-	362.5

	Mean Cover Percent by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	4.3	2.0	-	-	6.3

	Cover %	20 x 20* Frequency %
<i>Artemisia tridentata</i>	22.4	88.5
<i>Prunus andersonii</i>		2.0
<i>Purshia tridentata</i>		t**
<i>Ribes aureum</i>		t
<i>Agropyron desertorum</i>		2.5
<i>Bromus tectorum</i>		t
<i>Oryzopsis hymenoides</i>		t
<i>Microsteris</i> sp.		17.0
<i>Lygodesmia spinosa</i>		2.5
<i>Zigadenus paniculatus</i>		t

* Frame size in inches

** Trace

Table 20. Ground Cover Characteristics for the
Artemisia tridentata/*Pinus monophylla*
Community

Material	Cover %
Bare ground	4.0
Litter	25.0
Pavement	12.0
Rock	-
Vegetation	59.0

8. *Artemisia tridentata*/*Symphoricarpos vaccinioides*
Community

This community has developed in the western part of the watershed. At higher elevations it is usually bounded by the *Artemisia arbuscula*/*Poa secunda* community and at lower elevations by the *Pinus monophylla*/*A. tridentata*/*S. vaccinioides* community.

The mean annual precipitation for this community is 13.9 inches (Appendix A). Elevation is around 7450 feet. The community is found on northeast facing slopes around 30 percent.

Big sagebrush (*A. tridentata*) is the dominant plant in the community with 30.2 percent cover and 81.0 percent frequency. Mountain snowberry (*S. vaccinioides*) is the secondary dominant with 3.9 percent cover and 19.0 percent frequency. Golden currant (*Ribes aureum*) and gray horsebrush (*Tetradymia canescens*) are usually present with an average cover of 3.8 and 2.0 percent, and 19.0 and 11.0 percent frequency, respectively. Other shrubs are present only with low frequency values.

The most frequent (9.0 percent) grass is Letterman needlegrass (*Stipa lettermani*). Big Mountain brome (*Bromus marginatus*) and squirrel-tail (*Sitanion hystrix*) occur with 7.5 and 1.4 percent frequency.

Tailcup lupine (*Lupinus caudatus*) and Indian paintbrush (*Castilleja chromosa*) are the most frequent forbs with 21.0 and 6.0 percent, respectively. A variety of other forbs are found in small quantities (Table 21). This community is probably a *S. vaccinioides*/*A. tridentata*/*B. marginatus* habitat-type.

Vegetation accounts for 53.0 percent of the ground cover characteristics, litter 24.0 percent, pavement 19.0 percent and bare ground 4.0 percent (Table 22).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Entic Haploxerolls (Appendix B-39).

Table 21. Species Cover and Frequency for the
Artemisia tridentata/*Symphoricarpos*
vaccinioides Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Artemisia tridentata</i>	30.2	81.0
<i>Symphoricarpos vaccinioides</i>	3.0	19.0
<i>Ribes aureum</i>	3.8	19.0
<i>Tetradymia canescens</i>	2.0	11.9
<i>Amelanchier alnifolia</i>		2.0
<i>Chrysothamnus viscidiflorus</i>		2.0
<i>Chrysothamnus nauseosus</i>		t**
<i>Stipa letermanni</i>		9.0
<i>Bromus marginatus</i>		7.5
<i>Sitanion hystrix</i>		1.5
<i>Lupinus caudatus</i>		21.0
<i>Castilleja chromosa</i>		6.0
<i>Lappula redowskii</i>		2.5
<i>Allium acuminatum</i>		2.0
<i>Crepis acuminata</i>		2.0
<i>Eriogonum maculatum</i>		t
<i>Monardella odoratissima</i>		t
<i>Senecio integerrimus</i>		t

* Frame size in inches
 ** Trace

Table 22. Ground Cover Characteristics for the
Artemisia tridentata/*Symphoricarpos*
vaccinioides Community

<u>Material</u>	<u>Cover %</u>
Bare ground	4.0
Litter	24.0
Pavement	19.0
Rock	-
Vegetation	53.0

Shadscale (*Atriplex confertifolia*) Communities

1. *Atriplex confertifolia* Community

This community is found in the northern part of the watershed on the fans and hillside to the west of the main wash.

The mean annual precipitation for this community is 6.3 inches (Appendix A). Elevation ranges from 4780 to 5200 Feet. The community is found on northeast or southeast facing slopes of 2 to 22 percent.

The vegetation component of this community is characterized by numerous desert shrub species. Shadscale (*A. confertifolia*) is the dominant species with 4.6 percent cover and 29.5 percent frequency. Bud sagebrush (*Artemisia spinescens*) and Mormon tea (*Ephedra nevadensis*) occur in all stands with 4.0 percent or less frequency. Other shrubs, when present, occur in small amounts.

Cheatgrass (*Bromus tectorum*) and squirreltail (*Sitanion hystrix*) are present in the stand with 75.5 and 8.7 percent frequency, respectively. Mat muhly (*Muhlenbergia richardsonis*) and Indian ricegrass (*Oryzopsis hymenoides*) occur in 33 percent of the stands with low frequency values.

Eriogonum densum, *Eriastrum diffusum*, *Arabis* sp., *Navarretia* sp. and *Sphaeralcea coccinea* occur in all stands with 33.3, 28.3, 10.7, 6.5, and 3.3 percent frequency, respectively. *Amsinokia menziesii* and *Lappula redowskii* have a constancy of 33 and 67 percent and frequency of 16.0 and 13.2 percent, respectively. A variety of other forbs occur with constancy ratings of 67 percent or less and frequency values of 7.3 percent or less (Table 23). This community is probably an *A. confertifolia*/*O. hymenoides* habitat-type.

Pavement accounts for 39.7 percent of the ground cover characteristics, rock for 35.8 percent, vegetation for 9.5 percent, litter for 8.7 percent, and bare ground for 6.3 percent (Table 24).

The soils at the macroplots where this community was sampled are members of a clayey-skeletal, mixed, mesic family of Typic Durargids (Appendix B-18); or fine, mixed, mesic family of Typic Nadurargids (Appendix B-27).

Table 23. Species Cover, Frequency and Constancy for the
Atriplex confertifolia Community

Species	Cover %	Frequency %	Constancy %
<i>Atriplex confertifolia</i>	4.6	29.5	100
<i>Artemisia spinescens</i>		4.0	100
<i>Ephedra nevadensis</i>			100
<i>Artemisia tridentata</i>			67
<i>Tetradymia glabrata</i>			67
<i>Artemisia nova</i>			33
<i>Chrysothamnus viscidiflorus</i>			33
<i>Sarcobatus baileyi</i>			33
<i>Bromus tectorum</i>		75.5	100
<i>Sitanion hystrix</i>		8.7	100
<i>Muhlenbergia richardsonis</i>			33
<i>Oryzopsis hymenoides</i>			33
<i>Eriogonum densum</i>		33.3	100
<i>Eriastrum diffusum</i>		28.3	100
<i>Amsinckia menziesii</i>		16.0	33
<i>Lappula redowskii</i>		13.2	67
<i>Arabis</i> sp.		10.7	100
<i>Astragalus</i> sp.		7.3	67
<i>Erodium cicutarium</i>		7.0	67
<i>Navarretia</i> sp.		6.5	100
<i>Descurainia sophia</i>		4.3	67
<i>Sphaeralcea coccinea</i>		3.3	100
<i>Mentzelia multiflora</i>			67
<i>Cordylanthus ramosus</i>			33
<i>Oenothera multijuga</i>			33
<i>Opuntia ramosissima</i>			33
<i>Salsola kali</i> var. <i>tenuifolia</i>			33

* Frame size in inches

Table 24. Ground Cover Characteristics for the
Atriplex confertifolia Community

<u>Material</u>	<u>Cover %</u>
Bare ground	6.3
Litter	8.7
Pavement	39.7
Rock	35.8
Vegetation	9.5

2. *Atriplex confertifolia*/*Artemisia spinescens*
Community

This community is encountered in the northeastern and northcentral part of the watershed on hills at lower elevations and on fans at higher elevations.

The mean annual precipitation for this community is 7.3 inches (Appendix A). Elevation ranges from 4710 to 4980 feet. The community occurs on west, northwest and southeast facing slopes of 3 to 20 percent.

Shadscale (*A. confertifolia*) (12.5 percent cover and 31.7 percent frequency) and bud sagebrush (*A. spinescens*) (3.0 percent cover and 25.3 percent frequency) dominate the shrub and ground layers. Mormon tea (*Ephedra nevadensis*) has a constancy rating of 67 percent and a frequency value of 4.0 percent; while a large variety of other shrubs, when present, occur in trace amounts.

Cheatgrass (*Bromus tectorum*) occurs in all stands with an average frequency of 28.5 percent. Indian ricegrass (*Oryzopsis hymenoides*) and desert needlegrass (*Stipa speciosa*) have a constancy of 66 and 33 percent, respectively.

A large number of forbs occur in the community. *Eriogonum densum*, *Lappula redowskii*, *Navarretia* sp., *Arabis* sp., *Sphaeralcea coccinea*, *Mentzelia multiflora* and *Amsinckia menziesii* all have constancies of 100 percent and frequencies of 51.3, 51.2, 33.2, 15.3, 3.6, 3.6 and 1.0 percent respectively. The remaining forbs have small frequency values when present (Table 25). This community is probably an *A. confertifolia*/*A. spinescens* habitat-type.

Pavement accounts for 34.7 percent of the ground cover characteristics, rock for 31.7 percent, vegetation for 16.1 percent, litter for 10.3 percent and bare ground 7.2 percent (Table 26).

The soils at the macroplots where this community was sampled are members of a clayey-skeletal, mixed, mesic family of Lithic Haplargids (Appendix B-16); or fine, mixed, mesic family of Typic Nadurargids (Appendix B-27).

Table 25. Species Cover, Frequency and Constancy for the
Atriplex confertifolia/*Artemisia spinescens*
 Community

Species	Cover %	20 x 20*	
		Frequency %	Constancy %
<i>Atriplex confertifolia</i>	12.5	31.7	100
<i>Artemisia spinescens</i>	3.9	25.3	100
<i>Ephedra nevadensis</i>		4.0	67
<i>Chrysothamnus nauseosus</i>			33
<i>Eriogonum microthecum</i>			33
<i>Eurotia lanata</i>			33
<i>Grayia spinosa</i>			33
<i>Tetradymia glabrata</i>			33
<i>Tetradymia spinosa</i>			33
<i>Bromus tectorum</i>		28.5	33
<i>Oryzopsis hymenoides</i>			66
<i>Stipa speciosa</i>			33
<i>Eriogonum densum</i>		51.3	100
<i>Lappula redowskii</i>		51.2	100
<i>Naverretia</i> sp.		33.2	100
<i>Arabis</i> sp.		15.3	100
<i>Descurainia sophia</i>		6.0	66
<i>Eriastrum diffusum</i>		4.3	66
<i>Oenothera andina</i>		4.1	33
<i>Chaenactis douglasii</i>		3.7	66
<i>Sphaeralcea coccinea</i>		3.6	100
<i>Mentzelia multiflora</i>		3.6	100
<i>Abronia fragrans</i>		2.0	33
<i>Lepidium fremontii</i>		2.0	33
<i>Amsinckia menziesii</i>		1.8	100
<i>Astragalus</i> sp.			33
<i>Astragalus lentiginosus</i>			33
<i>Erysimum</i> sp.			33
<i>Erigeron pumilis</i>			33
<i>Erodium cicutarium</i>			33
<i>Lygodesmia spinosa</i>			33
<i>Opuntia</i> sp.			33

*Frame size in inches

Table 26. Ground Cover Characteristics for the
Atriplex confertifolia/*Artemisia spinescens*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	7.2
Litter	10.3
Pavement	34.7
Rock	31.7
Vegetation	16.1

Bromus tectorum Community

This community is found in the northwestern part of the watershed. It is bounded by the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata* community on the west and south, the *P. monophylla*/*J. osteosperma*/*Artemisia nova* community on the southeast, and the *A. nova*/*B. tectorum* community on the east.

The mean precipitation for this community is 10.7 inches (Appendix A). Elevation is around 7000 feet. The community occurs on south and east facing slopes of 40 percent.

This community has resulted from the burning of the *P. monophylla*/*J. osteosperma*/*A. tridentata* community. Cheatgrass (*B. tectorum*) has invaded and increased in the area to an average frequency of 93.5 percent. Squirreltail (*Sitanion hystrix*) is found with a frequency of 2.5 percent.

Golden currant (*Ribes aureum*) is the only shrub found in the community. *Arabis platysperma*, *Calochortus nuttallii*, *Lygodesmia spinosa* all occur with 1 percent frequency (Table 27). This community is a *P. monophylla*/*Juniperus osteosperma*/*A. tridentata*/*Stipa thurberiana* habitat-type.

Vegetation accounts for 32.5 percent of the ground cover characteristics, bare ground for 23.5 percent, litter for 16.0 percent, pavement for 15.0 percent, and rock for 13.0 percent (Table 28).

The A horizon has been completely eroded in many places and the B horizon is exposed. The soil at the macroplot where this community was sampled is a member of a fine, mixed, frigid family of Typic Argixerolls (Appendix B-34).

Table 27. Species frequency for the
Bromus tectorum Community

<u>Species</u>	<u>20 x 20* Frequency</u>
<i>Ribes aureum</i>	1.0
<i>Bromus tectorum</i>	93.5
<i>Sitanion hystrix</i>	2.5
<i>Arabis platysperma</i>	1.0
<i>Calochortus nuttallii</i>	1.0
<i>Lygodesmia spinosa</i>	1.0

* Frame size in inches

Table 28. Ground Cover Characteristics for the
Bromus tectorum Community

<u>Material</u>	<u>Cover %</u>
Bare ground	23.5
Litter	16.0
Pavement	15.0
Rock	13.0
Vegetation	32.5

Carex sp./*Juncus balticus* Community

This community usually occurs as inclusions at various places, mostly in the southwestern part of the watershed.

The mean precipitation is 11.2 inches (Appendix A). Elevation ranges from 5500 to 5800 feet. The community occurs on southeast facing slopes of 3 to 11 percent.

Big sagebrush (*A. tridentata*) is present with 2.0 percent cover and Woods rose (*Rosa woodsii*), when present, occurs in small quantities. Sedge (*Carex* sp.) and baltic rush (*J. balticus*) dominate the vegetation with 31.5 and 21.2 percent cover, respectively.

Creeping wildrye (*Elymus triticoides*) has a constancy rating of 50 percent and a cover value of 1.7 percent. Kentucky bluegrass (*Poa pratensis*), squirreltail (*Sitanion hystrix*) and a variety of other grasses occur sporadically in small amounts.

Monkeyflower (*Mimulus* sp.), common dandelion (*Taraxacum officinale*) western yarrow (*Achillea lanulosa*) and rocky mountain iris (*Iris missouriensis*) occur in all stands (100 percent constancy). Monkeyflower and common dandelion have 4.8 and 3.5 percent cover, respectively. Clover (*Trifolium* sp.) has a constancy of 50 percent and cover of 2.5 percent. All other forbs occur in small amounts when present (Table 29). This community is probably an *Elymus triticoides*/*Carex* sp. habitat-type.

Vegetation accounts for 67.9 percent of the ground cover characteristic, litter for 23.8 percent, bare ground for 7.8 percent, and rock for 0.5 percent (Table 30).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, mesic family of Fluventic Haplaquolls (Appendix B-30; or coarse-loamy, mixed, mesic family of Cumalic Haplaquolls (Appendix B-31).

Table 29. Species Cover and Constancy for the
Carex sp./*Juncus balticus* Community

<u>Species</u>	<u>Cover %*</u>	<u>Constancy %</u>
<i>Artemisia tridentata</i>	2.0	100
<i>Rosa woodsii</i>		50
<i>Carex</i> sp.	31.5	100
<i>Juncus balticus</i>	21.2	100
<i>Elymus triticoides</i>	1.7	50
<i>Poa pratensis</i>		100
<i>Sitanion hystrix</i>		100
<i>Agropyron repens</i>		50
<i>Agrostis alba</i>		50
<i>Bromus tectorum</i>		50
<i>Festuca octoflora</i>		50
<i>Mimulis</i> sp.	4.8	100
<i>Tanxacetum officinale</i>	3.5	100
<i>Trifolium</i> sp.	2.5	50
<i>Achillea lanulosa</i>		100
<i>Iris missouriensis</i>		100
<i>Ranunculus</i> sp.		50
<i>Verbascum thapsus</i>		50
<i>Vicia americana</i>		50
<i>Zigadenus paniculatus</i>		50
<i>Potentilla</i> sp.		50

* Point frame

Table 30. Ground Cover Characteristics for the
Carex sp./*Juncus balticus* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	7.8
Litter	23.8
Pavement	-
Rock	0.5
Vegetation	67.9

Cercocarpus ledifolius/*Artemisia tridentata* Community

This community is encountered at or near the top of the mountains in the western part of the watershed.

The mean annual precipitation for this community is 13.9 inches (Appendix A). Elevation is around 7650 feet. The community occurs on northeast facing slopes of 44 percent.

Curlleaf mountain mahogany (*C. ledifolius*) is the dominant species with 25.9 percent cover and 28.5 percent frequency. Big sagebrush (*A. tridentata*) is the subdominant species with an average of 4.1 percent cover and 34.0 percent frequency. Other shrubs like Saskatoon serviceberry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos vaccinioides*) and golden currant (*Ribes aureum*) are present in the community but in smaller amounts.

Squirreltail (*Sitanion hystrix*) is the most frequent grass with 26.0 percent. Sandberg bluegrass (*Poa secunda*), Rock melic (*Melica stricta*) and Letterman needlegrass (*Stipa lettermani*) are found also in the community with an average frequency of 5.5, 3.5, and 1.5 percent, respectively.

A variety of forbs are found. Indian paintbrush (*Castilleja chromosa*), Tapertip hawksbeard (*Crepis acuminata*) and Pacific monardella (*Monardella odoratissima*) are the most frequent with 7.5, 5.5 and 4.5 percent, respectively (Table 31). This community is probably a *C. ledifolius*/*Amelanchier alnifolia*/*Stipa lettermani* habitat-type.

Vegetation accounts for 37.5 percent of the ground cover characteristics, litter for 21.5 percent, rock for 18.0 percent, pavement for 15.5 percent, and bare ground for 7.5 percent (Table 32).

The soil at the macroplot where this community was described is a member of a coarse-skeletal, mixed, frigid family of Entic Haploxerolls (Appendix B-39).

Table 31. Species Cover and Frequency for the
Cercocarpus ledifolius/*Artemisia*
tridentata Community.

Species	Cover %	20 x 20* Frequency %
<i>Cercocarpus ledifolius</i>	25.9	28.5
<i>Artemisia tridentata</i>	4.1	34.0
<i>Amelanchier alnifolia</i>	2.0	9.5
<i>Symphoricarpos vaccinioides</i>	1.3	4.5
<i>Ribes aureum</i>		2.0
<i>Sitanion hystrix</i>		26.0
<i>Poa secunda</i>		5.5
<i>Melica stricta</i>		3.5
<i>Stipa lettermani</i>		1.5
<i>Castilleja chromosa</i>		7.5
<i>Crepis acuminata</i>		5.5
<i>Monardella odoratissima</i>		4.5
<i>Lupinus caudatus</i>		3.5
<i>Erigeron</i> sp.		2.5
<i>Phlox stansburyi</i>		2.5
<i>Lomatium</i> sp.		2.0
<i>Lappula redowskii</i>		1.5

* Frame size in inches

Table 32. Ground Cover Characteristics for the
Cercocarpus ledifolius/*Artemisia*
tridentata Community

Material	Cover %
Bare ground	7.5
Litter	21.5
Pavement	15.5
Rock	18.0
Vegetation	37.5

Chrysothamnus nauseosus/*Artemisia nova*/*Bromus tectorum*
Community

This community is located in the north central part of the watershed. It is bounded by the *A. nova*/*B. tectorum*/rock community on the northwest and west, the *A. nova*/*B. tectorum* community on the southwest and south, the *Artemisia tridentata*/*Ephedra nevadensis* community on the east, and the *A. tridentata*/*B. tectorum* (Low) community on the north-east.

The mean annual precipitation for this community is 7.8 inches (Appendix A). The elevation is around 4720 to 4780 feet. The community occurs on southeast or east facing slopes of 3 to 4 percent.

Rubber rabbitbrush (*C. nauseosus*) is the dominant shrub with 4.8 percent cover and 34.2 percent frequency. Black sagebrush (*A. nova*) is present with 1.1 percent cover and 5.8 percent frequency. Other shrubs like Mormon tea (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*) and littleleaf horsebrush (*Tetradymia glabrata*) occur in trace amounts when present.

Cheatgrass (*B. tectorum*) occurs in all stands with an average frequency of 75.7 percent. Mat muhly (*Muhlenbergia richardsonis*), squirreltail (*Sitanion hystrix*) and desert needlegrass (*Stipa speciosa*) have constancies of 50 to 100 percent, and 10.5, 3.5, and 2.0 percent frequency, respectively.

Alfileria (*Erodium cicutarium*), *Eriogonum densum*, annual stickseed (*Lappula redowskii*) are present in all stands and are the most frequent forbs with 59.5, 20.0 and 11.8 percent, respectively. *Erigeron pumilis*, *Gayophytum ramosissimum* and *Sphaeralcea coccinea* are also present in all stands but are infrequent. Other forbs, are sparse (Table 33). This community is probably an *A. nova*/*Oryzopsis hymenoides* habitat-type.

Rock accounts for 59.0 percent of the ground cover characteristics, litter for 19.5 percent, bare ground for 9.0 percent, vegetation for 7.7 percent, and pavement for 4.8 percent (Table 34).

The soils at the macroplots where this community was sampled are members of a fine, mixed, frigid family of Mollic Haplargids (Appendix B-15); or fine-loamy, mixed, frigid family of Mollic Durargids (Appendix B-22).

Table 33. Species Cover, Frequency and Constancy
for the *Chrysothamnus nauseosus*/*Artemisia*
nova/*Bromus tectorum* Community

Species	Cover %	20 x 20*	
		Frequency %	Constancy %
<i>Chrysothamnus nauseosus</i>	4.8	34.2	100
<i>Artemisia nova</i>	1.1	5.8	100
<i>Ephedra nevadensis</i>			50
<i>Grayia spinosa</i>			50
<i>Tetradymia glabrata</i>			50
<i>Bromus tectorum</i> (6 x 6)*		75.7	100
<i>Muhlenbergia richardsonis</i>		10.5	50
<i>Sitanion hystrix</i>		3.5	100
<i>Stipa speciosa</i>		2.0	50
<i>Erodium cicutarium</i> (6 x 6)*		59.5	100
<i>Eriogonum densum</i>		20.0	100
<i>Lappula redowskii</i> (6 x 6)*		11.8	100
<i>Calæhortus nuttallii</i>		3.5	50
<i>Descurainia sophia</i>		2.2	50
<i>Salsola kali</i> var. <i>tenuifolia</i>		2.0	50
<i>Erigeron pumilis</i>			100
<i>Gayophytum ramosissimum</i>			100
<i>Sphaeralcea coccinea</i>			100
<i>Astragalus</i> sp.			50
<i>Phlox diffusa</i>			50

* Frame size in inches

Table 34. Ground Cover Characteristics for the
Chrysothamnus nauseosus/*Artemisia nova*/
Bromus tectorum Community

Material	Cover %
Bare ground	9.0
Litter	19.5
Pavement	4.8
Rock	59.0
Vegetation	7.7

Chrysothamnus viscidiflorus Community

This community has developed in the northern part of the watershed. It is bounded by the *Atriplex confertifolia*/*Artemisia spinescens* community on the south, east and north; and the *Dalea polyadenia* community to the west.

The mean annual precipitation for this community is 6.8 inches (Appendix A). The elevation is around 4700 feet. The community is found on southwest and northeast facing slopes of 2 percent.

Yellowbrush (*C. viscidiflorus*) is the dominant shrub with an average cover of 5.8 percent and frequency of 33.5 percent. Shadscale (*A. confertifolia*), spiny hopsage (*Grayia spinosa*), and bud sagebrush (*A. spinescens*) occur with small cover and frequency values.

Cheatgrass (*Bromus tectorum*) and Indian ricegrass (*Oryzopsis hymenoides*) are the most frequent grass (30.5 and 21.0 percent, respectively). Squirreltail (*Sitanion hystrix*) is also present but with a frequency of 2.0 percent.

Navarretia sp., *Mentzelia multiflora*, groundsmoke (*Gayophytum ramosissimum*), *Eriogonum thomasi* and scarlet globemallow (*Sphaeralcea coccinea*) are the most frequent forbs in the community with 72.0, 61.0, 32.5, 25.0 and 20.5 percent, respectively. Other forbs have low frequency (Table 35). This community has been used as a bedding ground for sheep and is probably a seral representative of the *A. confertifolia*/*A. spinescens* habitat-type.

Bare ground accounts for 45.5 percent of the ground cover characteristics, vegetation for 20.0 percent, pavement for 17.0 percent, litter for 15.5 percent, and rock for 2.0 percent (Table 36).

The soil at the macroplot where this vegetation was sampled is a member of a fine, mixed, mesic family of Typic Haplargids (Appendix B-7).

Table 35. Species Cover and Frequency for the
Chrysothamnus viscidiflorus Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Chrysothamnus viscidiflorus</i>	5.8	33.5
<i>Atriplex canescens</i>	1.2	6.5
<i>Grayia spinosa</i>		2.0
<i>Artemisia spinescens</i>		1.5
<i>Bromus tectorum</i>		30.5
<i>Oryzopsis hymenoides</i>		21.0
<i>Sitanion hystrix</i>		2.0
<i>Navarretia</i> sp.		72.0
<i>Mentzelia multiflora</i>		61.0
<i>Gayophytum ramosissimum</i>		32.5
<i>Eriogonum thomasi</i>		25.0
<i>Sphaeralcea coccinea</i>		20.5
<i>Phacelia</i> sp.		6.0
<i>Abronia fragrans</i>		1.0
<i>Astragalus</i> spp.		1.0
<i>Descurainia sophia</i>		1.0
<i>Cleome lutea</i>		t**
<i>Eriastrum diffusum</i>		t

* Frame size in inches

** Trace

Table 36. Ground Cover Characteristics for the
Chrysothamnus viscidiflorus Community

<u>Material</u>	<u>Cover %</u>
Bare ground	45.5
Litter	15.5
Pavement	17.0
Rock	2.0
Vegetation	20.0

Dalea polyadenia Community

This community is found in the northern part of the watershed. It is bounded by the *Artemisia tridentata*/*D. polyadenia* community on the north, west, and south, and the *Chrysothamnus viscidiflorus* community on the east.

The mean annual precipitation for this community is 6.8 inches (Appendix A). Elevation is around 4640 feet. The community is found on west facing drainage bottoms with 1 percent slope.

Nevada dalea (*D. polyadenia*) is the dominant shrub with 6.4 percent cover and 33.0 percent frequency. Shadscale (*Atriplex confertifolia*) occurs with 2.2 percent cover and a frequency of 7.5 percent. Little-leaf horsebrush (*Tetradymia glabrata*) and big sagebrush (*A. tridentata*) are also found in the community.

Indian ricegrass (*Oryzopsis hymenoides*) is the most frequent grass (7.0 percent) with cheatgrass (*Bromus tectorum*), squirreltail (*Sitanion hystrix*) and needle-and-thread grass (*Stipa comata*) less frequent.

Phacelia spp., sandverbena (*Abronia fragrans*) and groundsmoke (*Gayophytum ramosissimum*) are the most abundant forbs with 76.0, 57.0, and 47.5 percent frequency, respectively. A number of other shrubs occur but with lower frequency (Table 37). This community is probably a *D. polyadenia*/*O. hymenoides* habitat-type.

Bare ground accounts for 52.5 percent of the ground cover characteristics, vegetation for 36.0 percent, litter for 8.5 percent, pavement for 2.5 percent, and rock for 0.5 percent (Table 38).

The soil at the macroplot where this community was sampled is a member of a sandy, mixed, mesic family of Typic Torripsamments (Appendix B-1).

Table 37. Species Cover and Frequency for the
Dalea polyadenia Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Dalea polyadenia</i>	6.4	33.0
<i>Atriplex canescens</i>	2.2	7.5
<i>Eurotia lanata</i>		6.5
<i>Tetradymia glabrata</i>		3.0
<i>Artemisia tridentata</i>		t**
<i>Oryzopsis hymenoides</i>		7.0
<i>Bromus tectorum</i>		5.5
<i>Sitanion hystrix</i>		5.5
<i>Stipa comata</i>		t
<i>Phacelia</i> spp.		76.0
<i>Abronia fragrans</i>		57.0
<i>Gayophytum ramosissimum</i>		47.5
<i>Mentzelia multiflora</i>		24.5
<i>Cleome lutea</i>		17.0
<i>Navarretia</i> sp.		16.5
<i>Sphaeralcea coccinea</i>		7.5
<i>Descuriania sophia</i>		t

* Frame size in inches

** Trace

Table 38. Ground Cover Characteristics for the
Dalea polyadenia Community

<u>Material</u>	<u>Cover %</u>
Bare ground	52.5
Litter	8.5
Pavement	2.5
Rock	0.5
Vegetation	36.0

Mormon tea (*Ephedra nevadensis*) Communities

1. *Ephedra nevadensis* Community

This community is located in the northern part of the watershed in the main drainage. It is bounded by the *Artemisia tridentata*/*E. nevadensis* community on the north and south, the *E. nevadensis*/*Chrysothamnus viscidiflorus*/*Sarcobatus baileyi* community on the east, and the *S. baileyi*/*Atriplex confertifolia* community on the west.

The mean annual precipitation for this community is 6.5 inches (Appendix A). Elevation ranges from 4650 to 4690 feet. The community is found in west or northeast facing drainage bottoms with 1 to 2 percent slope.

Mormon tea (*E. nevadensis*) is the dominant shrub with 5.7 percent cover and 24.8 percent frequency. Spiny hopsage (*Grayia spinosa*) occurs in all stands with an average 10.0 percent frequency. A large number of additional shrubs occur sporadically throughout the community with low frequency values.

Cheatgrass (*Bromus tectorum*) and Indian ricegrass (*Oryzopsis hymenoides*) are present in all stands sampled with a frequency of 18.0 and 7.7 percent, respectively. Squirreltail (*Sitanion hystrix*) occurs with a constancy of 33 percent.

A variety of forbs are found in the community with *Eriogonum densum*, *Mentzelia multiflora*, *Navarretia* sp. present in all stands with 45.9, 36.5 and 30.2 percent frequency, respectively. *Phacelia* spp., *Oenothera multijuga* and *Oenothera contorta* are also present in all stands sampled but have low frequency values. A number of other forbs are sparse (Table 39). This community is probably an *E. nevadensis*/*O. hymenoides* habitat-type.

Bare ground accounts for 40.8 percent of the ground cover characteristics, litter for 19.0 percent, vegetation for 17.3 percent, pavement for 16.2 percent, and rock for 6.7 percent (Table 40).

The soil at the macroplot where this community was sampled is a member of a sandy, mixed, mesic family of Typic Torripsamments (Appendix B-1).

Table 39. Species Cover, Frequency and Constancy
for the *Ephedra nevadensis* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
<i>Ephedra nevadensis</i>	5.7	24.8	100
<i>Grayia spinosa</i>		10.0	100
<i>Chrysothamnus viscidiflorus</i>		6.8	67
<i>Atriplex canescens</i>		3.5	33
<i>Artemisia tridentata</i>			33
<i>Eurotia lanata</i>			33
<i>Prunus andersonii</i>			33
<i>Sarcobatus baileyi</i>			33
<i>Bromus tectorum</i>		18.0	100
<i>Oryzopsis hymenoides</i>		7.7	100
<i>Sitanion hystrix</i>			33
<i>Eriogonum densum</i>		45.9	100
<i>Mentzelia multiflora</i>		36.5	100
<i>Navarretia</i> sp.		30.2	100
<i>Gayophytum ramosissium</i>		12.3	67
<i>Abronia fragrans</i>		9.0	67
<i>Phacelia</i> spp.		8.2	100
<i>Sphaeralcea coccinea</i>		2.7	33
<i>Amsinckia menziesii</i>		2.0	33
<i>Arabis</i> sp.		2.0	33
<i>Eriastrum diffusum</i>		2.0	33
<i>Oenothera multijuga</i>		2.0	100
<i>Oenothera contorta</i>			100
<i>Oenothera</i> sp.			67
<i>Chenopodium</i> sp.			33

* Frame size in inches

Table 40. Ground Cover Characteristics for the
Ephedra nevadensis Community

<u>Material</u>	<u>Cover %</u>
Bare ground	40.8
Litter	19.0
Pavement	16.2
Rock	6.7
Vegetation	17.3

2. *Ephedra nevadensis*/*Chrysothamnus viscidiflorus*/
Sarcobatus baileyi Community

This community has developed in the northeastern part of part of the watershed and is bounded by the *S. baileyi*/*Atriplex confertifolia* community on the east and the *E. nevadensis* community on the west.

The mean annual precipitation for this community is 6.2 inches (Appendix A). Elevation is around 4860 feet. The community occurs in west facing drainage bottoms with 2 percent slopes.

Mormon tea (*E. nevadensis*) is the dominant shrub with a cover of 6.1 percent and a frequency of 18.5 percent. Yellowbrush (*C. viscidiflorus*) and bailey greasewood (*S. baileyi*) are subdominants with 1.8 and 1.5 percent cover, and 17.5 and 8.5 percent frequency. A number of other shrubs occur in trace amounts.

Cheatgrass (*Bromus tectorum*) is the most abundant grass with 36.5 percent frequency. Indian ricegrass (*Oryzopsis hymenoides*) has a frequency of 8.0 percent and squirreltail (*Sitanion hystrix*) occurs in trace amounts.

A number of forbs have a frequency value between 31.0 and 10.0 percent. These are: *Navarretia* sp., *Phacelia* sp., *Oenothera* sp., *Mentzelia multiflora*, *Eriogonum densum*, *Eriogonum thomasi* and *Astragalus hornii*. A few additional forbs have frequency values below 10.0 percent (Table 41). This community is probably an *E. nevadensis*/*O. hymenoides* habitat-type.

Bare ground accounts for 62.5 percent of the ground cover characteristics, vegetation for 16.5 percent, litter for 13.5 percent, pavement for 7.0 percent, and rock for 0.5 percent (Table 42).

The soils at the macroplot where this community was sampled is a member of a sandy, mixed, mesic family of Typic Torripsamments (Appendix B-1).

Table 41. Species Cover and Frequency for the
Ephedra nevadensis/*Chrysothamnus*
viscidiflorus/*Sarcobatus baileyi*
 Community

Species	Cover %	20 x 20* Frequency %
<i>Ephedra nevadensis</i>	6.1	18.5
<i>Chrysothamnus viscidiflorus</i>	1.8	17.5
<i>Sarcobatus baileyi</i>	1.5	8.5
<i>Artemisia spinescens</i>		t**
<i>Eurotia lanata</i>		t
<i>Grayia spinosa</i>		t
<i>Tetradymia glabrata</i>		t
<i>Bromus tectorum</i>		36.5
<i>Oryzopsis hymenoides</i>		8.0
<i>Sitanion hystrix</i>		t
<i>Navarretia</i> sp.		31.0
<i>Phacelia</i> sp.		29.0
<i>Oenothera</i> sp.		21.0
<i>Mentzelia multiflora</i>		20.5
<i>Eriogonum densum</i>		19.5
<i>Eriogonum thomasi</i>		17.5
<i>Astragalus hornii</i>		10.5
<i>Oenothera multi-juga</i>		8.0
<i>Arabis</i> sp.		5.0
<i>Sphaeralcea coccinea</i>		4.5
<i>Oenothera contorta</i>		4.0
<i>Amsinckia menziesii</i>		t

* Frame size in inches

** Trace

Table 42. Ground Cover Characteristics for the
Ephedra nevadensis/*Chrysothamnus*
viscidiflorus/*Sarcobatus baileyi*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	62.5
Litter	13.5
Pavement	7.0
Rock	0.5
Vegetation	16.5

Eurotia lanata Community

This community is encountered in the north central part of the watershed mostly as inclusions within the *Artemisia tridentata*/*Ephedra nevadensis* community.

The mean annual precipitation for this community is 5.8 inches (Appendix A). Elevation is 4825 feet. The community is found in south-east facing drainage bottoms with 1 percent slope.

Winterfat (*E. lanata*) is the dominant species with 6.6 percent cover and 64.4 percent frequency. Spiny hopsage (*Grayia spinosa*) is also found in the community but in very small amounts.

Indian ricegrass (*Oryzopsis hymenoides*) is present with 6.0 percent frequency. *Phacelia* sp. and Russian thistle (*Salsola kali* var. *tenuifolia*) are the most frequent forbs with 70.0 and 56.6 percent, respectively. Other forbs occur with a frequency less than 12.0 percent (Table 43). This community is probably an *E. lanata*/*O. hymenoides* habitat-type.

Bare ground accounts for 42.0 percent of the ground cover characteristics, pavement for 33.0 percent, vegetation for 17.0 percent, litter for 7.0 percent, and rock for 1.0 percent (Table 44).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, mesic family of Typic Torriorthents (Appendix B-2).

Table 43. Species Cover and Frequency for the
Eurotia lanata Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Eurotia lanata</i>	6.6	64.5
<i>Grayia spinosa</i>		t**
<i>Oryzopsis hymenoides</i>		6.0
<i>Phacelia</i> sp.		70.0
<i>Salsola kali</i> var. <i>tenuifolia</i>		56.6
<i>Navarretia</i> sp.		11.5
<i>Sphaeralcea coccinea</i>		4.5
<i>Eriogonum</i> sp.		t
<i>Eriogonum thomasi</i>		t
<i>Mentzelia multiflora</i>		t
<i>Oenothera</i> sp.		t

* Frame size in inches

** Trace

Table 44. Ground Cover Characteristics for the
Eurotia lanata Community

<u>Material</u>	<u>Cover %</u>
Bare ground	42.0
Litter	7.0
Pavement	33.0
Rock	1.0
Vegetation	17.0

Spiny hopsage (*Grayia spinosa*) Communities

1. *Grayia spinosa*/*Artemisia nova*/*Stipa speciosa* Community

This community has developed in the northern part of the watershed. It is bounded by *A. nova*/*Bromus tectorum*/rock on the west, *Sarcobatus baileyi*/*Atriplex confertifolia* on the south and the *Artemisia tridentata*/*Ephedra nevadensis* community on the east and north.

The mean annual precipitation for this community is 8.0 inches (Appendix A). Elevation is around 4895 feet. The community is found on northeast facing slopes of 8 percent.

Spiny hopsage (*G. spinosa*) is the dominant shrub with 3.6 percent cover and 30.0 percent frequency. Black sagebrush (*A. nova*) occurs as a subdominant with a cover of 1.8 percent and 35.0 percent frequency. Mormon tea (*E. nevadensis*), bud sagebrush (*Artemisia spinescens*), and winterfat (*Eurotia lanata*) are all present but in small quantities.

Cheatgrass (*Bromus tectorum*) is the most frequent grass with 45.5 percent. However, desert needlegrass (*Stipa speciosa*) and squirrel-tail (*Sitanion hystrix*) are present with frequencies of 7.0 and 6.0 percent. A few additional grasses are present in trace amounts.

Navarretia sp. is the most frequent forb (62.5 percent). *Eriastrum diffusum*, *Mentzelia multiflora*, *Gayophytum ramosissimum*, *Arabis* sp., *Ericgonum densum* and *Erodium cicutarium* occur with frequency values between 24.0 and 14.5 percent. Additional forbs present have frequency percentages below 8.0 (Table 45). This community is probably a *G. spinosa*/*A. nova*/*S. speciosa* habitat-type.

Rock accounts for 42.0 percent of the ground cover characteristics, pavement for 25.5 percent, vegetation for 12.0 percent, litter for 10.5 percent and bare ground for 10.0 percent (Table 46).

The soil at the macroplot where this vegetation was described is a member of a fine, mixed, mesic family of Mollic Durargids (Appendix B-23).

Table 45. Species Cover and Frequency for the
Grayia spinosa/*Artemisia nova*/*Stipa*
speciosa Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Grayia spinosa</i>	3.6	30.0
<i>Artemisia nova</i>	1.8	35.0
<i>Ephedra nevadensis</i>	0.8	2.5
<i>Artemisia spinescens</i>		t**
<i>Eurotia lanata</i>		t
<i>Bromus tectorum</i>		45.5
<i>Stipa speciosa</i>		7.0
<i>Sitanion hystrix</i>		6.0
<i>Festuca octoflora</i>		t
<i>Muhlenbergia richardsonis</i>		t
<i>Oryzopsis hymenoides</i>		t
<i>Navarretia</i> sp.		62.5
<i>Eriastrum diffusum</i>		24.0
<i>Mentzelia multiflora</i>		22.0
<i>Gayophytum ramosissimum</i>		21.0
<i>Arabis</i> sp.		15.0
<i>Eriogonum densum</i>		14.5
<i>Erodium cicutarium</i>		14.5
<i>Machaeranthera canescens</i>		7.5
<i>Lappula redowskii</i>		7.0
<i>Eriogonum thomasi</i>		4.5
<i>Eriogeron pumilis</i>		t
<i>Spharalcea coccinea</i>		t

* Frame size in inches

** Trace

Table 46. Ground Cover Characteristics for the
Grayia spinosa/*Artemisia nova*/*Stipa*
speciosa Community

<u>Material</u>	<u>Cover %</u>
Bare ground	10.0
Litter	10.5
Pavement	25.5
Rock	42.0
Vegetation	12.0

2. *Grayia spinosa*/*Chrysothamnus viscidiflorus* Community

This community is found in the eastern part of the watershed. It is bounded on the south and west by the *Artemisia nova*/*Bromus tectorum*/rock community, on the north by the *Sarcobatus baileyi*/*Chrysothamnus viscidiflorus* community and on the east by the *Artemisia tridentata* /*Bromus tectorum* (Low) community.

The mean annual precipitation for this community is 7.0 inches (Appendix A). Elevation is around 5000 feet. The community occurs in northeast facing drainage bottoms with 1 percent slope.

Spiny hopsage (*G. spinosa*) and yellowbrush (*C. viscidiflorus*) are co-dominants with cover percents of 4.2 and 5.4, respectively. Bud sagebrush (*Artemisia spinescens*), winterfat (*Eurotia lanata*) and black sagebrush (*A. nova*) are present with 12.0, 3.5 and 2.0 percent frequency, respectively.

Squirreltail (*Sitanion hystrix*) has a frequency of 4.5 percent. *Oenothera contorta* and *Mentzelia multiflora* are the most frequent forbs with 13.0 and 7.5 percent frequency. A number of additional forbs occur with frequency values of 3.5 percent or less (Table 47). This community is probably a *G. spinosa*/*Artemisia spinescens* habitat-type.

Pavement accounts for 60.5 percent of the ground cover characteristics, vegetation for 18.5 percent, litter for 17.5 percent, bare ground for 2.5 percent and rock for 1.0 percent (Table 48).

The soil at the macroplot where this vegetation was sampled is a member of a loamy-skeletal, mixed, mesic family of Mollic Camborthids (Appendix B-4).

Table 47. Species Cover and Frequency for the
Grayia spinosa/*Chrysothamnus viscidiflorus*
 Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Chrysothamnus viscidiflorus</i>	5.4	36.5
<i>Grayia spinosa</i>	4.2	21.5
<i>Artemisia spinescens</i>		12.0
<i>Eurotia lanata</i>		3.5
<i>Artemisia nova</i>		2.0
<i>Sitanion hystrix</i>		4.5
<i>Oenothera contorta</i>		13.0
<i>Mentzelia multiflora</i>		7.5
<i>Lappula redowskii</i>		3.5
<i>Castilleja chromosa</i>		3.0
<i>Gayophytum ramosissimum</i>		2.5
<i>Navarretia</i> sp.		2.0
<i>Astragalus</i> sp.		1.5
<i>Amsinckia menziesii</i>		t**
<i>Chaenactis douglasii</i>		t
<i>Eriastrum diffusum</i>		t
<i>Sphaeralcea coccinea</i>		t

*Frame size in inches

** Trace

Table 48. Ground Cover Characteristics for the
Grayia spinosa/*Chrysothamnus viscidiflorus*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	2.5
Litter	17.5
Pavement	60.5
Rock	1.0
Vegetation	18.5

Pinyon (*Pinus monophylla*) Communities

1. *Pinus monophylla* Community

This community is found in the western part of the watershed and is usually bounded by the *P. monophylla*/*Artemisia tridentata*, or the *P. monophylla*/*Juniperus osteosperma*/*A. tridentata* community.

The mean annual precipitation for this community is 14.4 inches (Appendix A). Elevation ranges upwards from 5720 to 6210 feet. It occurs on north and northeast facing slopes of 6 to 60 percent.

Pinyon (*P. monophylla*) is the dominant species and forms a closed community. It has about equal density in each maturity class with a total density of 410.0 trees/acre. Maturity classes 3 and 4 provide most of the cover (31.7 and 55.6 percent) with a total pinyon cover for the four maturity classes of 98.9 percent. A few young juniper (*Juniperus osteosperma*), maturity classes 1 and 2, occur with a total density of 3.7 trees/acre.

Golden currant (*Ribes aureum*) is the most frequent shrub (5.5 percent) with a cover of 1.5 percent. A number of other shrubs occur sporadically in very small amounts.

Cheatgrass (*Bromus tectorum*) and Sandberg bluegrass (*Poa secunda*), when present, are the most frequent grasses with 3.9 and 2.8 percent. Indian ricegrass (*Oryzopsis hymenoides*) and squirreltail (*Sitanion hystrix*) have constancies of 25 and low frequency.

Gayophytum ramosissimum and *Oenothera contorta* have constancies of 75 percent and frequencies of 23.6 and 23.5 percent, respectively. A variety of other forbs occur sporadically with 5.4 percent frequency or less (Table 49). This community is a *P. monophylla* habitat-type.

Litter accounts for 56.5 percent of the ground cover characteristics, vegetation for 12.5 percent, bare ground for 11.1 percent, rock for 10.5 percent, and pavement for 9.4 percent (Table 50).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, frigid family of Typic Argixerolls (Appendix B-33); a coarse-loamy, mixed, frigid family of Entic Haploxerolls (Appendix B-39); loamy-skeletal, mixed, frigid family of Entic Haploxerolls (Appendix B-40); or coarse-loamy, mixed, frigid family of Cumulic Haploxerolls (Appendix B-41).

Table 49. Species Cover, Frequency, Constancy and Density for the *Pinus monophylla* Community

Species	Mean Density (trees/A) by maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	114.0	104.0	101.0	91.0	410.0
<i>Juniperus osteosperma</i>	1.2	2.5			3.7
Mean Cover Percent by Maturity Class					
<i>Pinus monophylla</i>	1.4	10.1	31.7	55.6	98.8
Mean Cover, Frequency and Constancy of Non-tree Species					
	20 x 20*				
	Cover %	Frequency %	Constancy %		
<i>Ribes aureum</i>	1.5	5.5	100		
<i>Purshia tridentata</i>			50		
<i>Artemisia tridentata</i>			25		
<i>Chrysothamnus nauseosus</i>			25		
<i>Ephedra viridis</i>			25		
<i>Symphoricarpos vaccinioides</i>			25		
<i>Bromus tectorum</i>		3.9	50		
<i>Poa secunda</i>		2.8	25		
<i>Oryzopsis hymenoides</i>		1.2	25		
<i>Sitanion hystrix</i>			25		
<i>Gayophytum ramosissimum</i>		23.6	75		
<i>Oenothera contorta</i>		23.5	75		
<i>Microsteris</i> sp.		5.4	25		
<i>Amsinckia menziesii</i>		3.1	25		
<i>Phoenicaulis cheiranthoides</i>		3.1	25		
<i>Lappula redowskii</i>		1.2	25		
<i>Cryptantha</i> sp.		1.2	25		
<i>Eriastrum diffusum</i>			50		
<i>Allium acuminatum</i>			25		
<i>Erigeron pumilus</i>			25		
<i>Lygodesmia spinosa</i>			25		
<i>Mimulus</i> sp.			25		
<i>Phlox longifolia</i>			25		

*Frame size in inches

Table 50. Ground Cover Characteristics for the
Pinus monophylla Community

<u>Material</u>	<u>Cover %</u>
Bare ground	11.1
Litter	56.5
Pavement	9.4
Rock	10.5
Vegetation	12.5

2. *Pinus monophylla*/*Artemisia tridentata* Community

This community is found in the western part of the watershed on mountains, hills and undulating slopes.

The mean annual precipitation for this community is 12.4 inches (Appendix A). Elevation is 5600 to 6150 feet. The community occurs on east, northeast and southeast facing slopes of 4 to 52 percent.

Pinyon (*P. monophylla*) dominates the overstory with a density of 286.0 trees/acre and cover of 43.8 percent. A majority of the trees occur in maturity classes 1 and 2 (115.0 and 87.5 density, respectively) and indicate that pinyon is increasing. However, the larger trees (maturity classes 3 and 4) account for most of the cover with 18.0 and 15.7 percent.

Big sagebrush (*A. tridentata*) is present in all stands with a cover of 4.5 percent and a frequency of 19.0 percent. Bitterbrush (*Purshia tridentata*) is also present in most stands with a cover of 2.4 percent and a frequency of 10.1 percent. A number of additional shrubs are encountered sporadically through the community.

Cheatgrass (*Bromus tectorum*) and squirreltail (*Sitanion hystrix*) have constancies of 100 percent and frequencies of 49.2 and 3.1 percent, respectively. Desert needlegrass (*Stipa speciosa*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Oryzopsis hymenoides*) occur erratically through the community with small frequency values.

Gayophytum ramosissimum and *Oenothera contorta* are the most frequent forbs with 11.8 and 8.2 percent and have constancies of 75 and 50 percent, respectively. A large number of additional forbs occur but in small varied amounts (Table 51). This community is probably a *P. monophylla*/*A. tridentata*/*O. hymenoides* habitat-type.

Vegetation accounts for 32.6 percent of the ground cover characteristics, litter for 29.4 percent, pavement for 19.6 percent, bare ground for 12.8 percent, and rock for 5.6 percent (Table 52).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Mollic Haplargids (Appendix B-12); loamy-skeletal, mixed, frigid family of Lithic Haploxerolls (Appendix B-38); coarse-loamy, mixed, frigid family of Entic Haploxerolls (Appendix B-39); or fine, mixed, frigid family of Typic Argixerolls (Appendix B-34).

Table 51. Species Cover, Frequency, Constancy and Density
for the *Pinus monophylla*/*Artemisia tridentata*
Community

Species	Mean Density (trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	115.0	87.5	57.5	26.0	286.0

Mean Cover Percent by Maturity Class

<i>Pinus monophylla</i>	1.4	8.5	18.0	15.9	43.8
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Mean Cover, Frequency and Constancy of Non-tree Species

	Cover %	²⁰ x ²⁰ * Frequency %	Constancy %
<i>Artemisia tridentata</i>	4.5	19.0	100
<i>Purshia tridentata</i>	2.4	10.1	100
<i>Ephedra viridis</i>		4.6	75
<i>Tetradymia canescens</i>		1.8	75
<i>Chrysothamnus nauseosus</i>			25
<i>Chrysothamnus viscidiflorus</i>			25
<i>Prunus andersonii</i>			25
<i>Ribes aureum</i>			25
<i>Bromus tectorum</i>		49.2	100
<i>Sitanion hystrix</i>		3.1	100
<i>Stipa speciosa</i>		2.5	50
<i>Poa secunda</i>		1.5	50
<i>Oryzopsis hymenoides</i>			25
<i>Gayophytum ramosissimum</i>		11.8	75
<i>Oenothera contorta</i>		8.2	50
<i>Eriastrum diffusum</i>		1.8	50
<i>Eriogonum thomasi</i>		1.8	75
<i>Lygodesmia spinosa</i>			75
<i>Allium atrorubens</i>			50
<i>Mentzelia multiflora</i>			50
<i>Navarretia</i> sp.			50
<i>Allium acuminatum</i>			25
<i>Amsinckia menziesii</i>			25
<i>Astragalus purshii</i>			25
<i>Calochortus nuttallii</i>			25
<i>Castilleja chromosa</i>			25
<i>Eriogonum densum</i>			25
<i>Lappula redowskii</i>			25

* Frame size in inches

Table 52. Ground Cover Characteristics for the
Pinus monophylla/*Artemisia tridentata*
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	12.8
Litter	29.4
Pavement	19.6
Rock	5.6
Vegetation	32.6

3. *Pinus monophylla*/*Symphoricarpos vaccinioides*/
Artemisia tridentata Community

This community is encountered in the western part of the watershed on mountainous slopes. It usually occurs above the *P. monophylla*/*A. tridentata* community and below the *A. tridentata*/*S. vaccinioides* community.

The mean annual precipitation for this community is 14.4 inches (Appendix A). Elevation is around 6900 feet. The community occurs on northeast facing slopes of 45 percent.

Pinyon (*P. monophylla*) occurs with a density of 170.0 trees/acre and a cover of 25.7 percent. Most of the trees occur in maturity class 1 and indicate a pinyon increase. About equal numbers are found in maturity classes 2, 3 and 4. As usual, the more mature trees account for most of the cover.

The shrub layer is dominated by snowberry (*S. vaccinioides*) and by big sagebrush (*A. tridentata*) with 14.4 and 8.1 percent cover, and frequencies of 51.0 and 48.0 percent, respectively. Bitterbrush (*Purshia tridentata*) and golden currant (*Ribes aureum*) are present with 3.0 and 2.6 percent cover and 12.5 and 15.5 percent frequency. A variety of other shrubs are found with low frequency.

Squirreltail (*Sitanion hystrix*), Letterman needlegrass (*Stipa lettermani*) and Sandberg bluegrass (*Poa secunda*) are present in the community with low frequencies of 4.5, 2.0 and 1.5 percent, respectively.

Lomatium sp. and *Allium acuminatum* are the most frequent forbs with 5.0 and 4.0 percent. Other forbs occur with frequency values of 3.5 percent or less (Table 53). This community is probably a *P. monophylla*/*S. vaccinioides*/*A. tridentata*/*Stipa lettermani* habitat-type.

Vegetation accounts for most of the ground cover characteristics (57.5 percent), pavement for 22.0 percent, litter for 14.5 percent, rock for 4.0 percent and bare ground for 2.0 percent (Table 54).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Entic Haploxerolls (Appendix B-39).

Table 53. Species Cover, Frequency and Density
for the *Pinus monophylla*/*Symphoricarpos*
vaccinioides/*Artemisia tridentata*
Community

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	95.0	30.0	20.0	25.0	170.0
Mean Cover Percent by Maturity Class					
<i>Pinus monophylla</i>	1.2	2.9	6.3	15.3	25.7

Mean Cover and Frequency of Non-tree Species

	Cover %	20 x 20* Frequency %
<i>Symphoricarpos vaccinioides</i>	14.4	51.0
<i>Artemisia tridentata</i>	8.1	48.0
<i>Purshia tridentata</i>	3.0	12.5
<i>Ribes aureum</i>	2.6	15.5
<i>Eriogonum microthecum</i>		5.0
<i>Ephedra viridis</i>		2.5
<i>Chrysothamnus viscidiflorus</i>		2.0
<i>Tetradymia canescens</i>		1.0
<i>Amelanchier alnifolia</i>		t**
<i>Sitanion hystrix</i>		4.5
<i>Stipa lettermani</i>		2.0
<i>Poa secunda</i>		1.5
<i>Lomatium</i> sp.		6.0
<i>Allium acuminatum</i>		4.0
<i>Phlox longifolia</i>		3.5
<i>Erysimum</i> sp.		2.0
<i>Gayophytum</i> sp.		1.5
<i>Amsinckia menziesii</i>		1.0
<i>Lappula redowskii</i>		t

* Frame size in inches

**Trace

Table 54. Ground Cover Characteristics for the
Pinus monophylla/*Symphoricarpos vaccinioides*/
Artemisia tridentata Community

<u>Material</u>	<u>Cover %</u>
Bare ground	2.0
Litter	14.5
Pavement	22.0
Rock	4.0
Vegetation	57.5

Pinyon-juniper (*Pinus monophylla* and *Juniperus osteosperma*) Communities

1. *Pinus monophylla*/*Juniperus osteosperma*/
Artemisia arbuscula Community

This community has developed in the western part of the watershed in the area of Sunrise Pass. It is usually bounded by the *P. monophylla*/*J. osteosperma*/*A. tridentata* community or the *P. monophylla*/*A. tridentata* community.

The mean annual precipitation for this community is 13.9 inches (Appendix A). The community occurs at elevation around 6900 feet and is found on southeast facing slopes of 14 percent.

Pinyon (*P. monophylla*), juniper (*J. osteosperma*) and low sagebrush (*A. arbuscula*) are the most characteristic species of the plant community. Respectively, they provide 33.6, 13.8 and 3.8 percent foliage cover. A majority of the pinyon cover occurs in maturity classes 2, 3 and 4 while most of the juniper cover is accounted for in maturity classes 3 and 4. Pinyon is present with an average density of 220.0 trees/acre and juniper with a density of 50.0 trees/acre. Pinyon density is higher in maturity classes 1 and 2, while juniper density is fairly evenly spaced through the four maturity classes.

Big sagebrush (*A. tridentata*), yellowbrush (*Chrysothamnus viscidiflorus*) and bitterbrush (*Purshia tridentata*) are usually found in the community but with low frequency.

Cheatgrass (*Bromus tectorum*) and squirreltail (*Sitanion hystrix*) are the most frequent grasses with 19.5 and 10.0 percent. Mountain brome (*Bromus marginatus*) and Sandberg bluegrass (*Poa secunda*) are also present but in small quantities.

Cordylanthus ramosus, *Allium acuminatum* and *Phlox longifolia* are usually present with low frequency values (6.5, 4.0 and 4.0 percent, respectively). A few other forbs are found in the community but in very small amounts (Table 55). This community is probably a *P. monophylla*/*J. osteosperma*/*A. arbuscula*/*Bromus marginatus* habitat-type.

Bare ground accounts for 31.0 percent of the ground cover characteristics, vegetation for 30.5 percent, litter for 28.5 percent, rock for 9.5 percent and pavement for 0.5 percent (Table 56).

The soil at the macroplot where this community was sampled is a member of a very-fine, mixed, frigid family of Vertic Argixerolls (Appendix B-37).

Table 55. Species Cover, Frequency and Density for the
Pinus monophylla/*Juniperus osteosperma*/*Artemisia*
arbuscula Community

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	85.0	80.0	30.0	25.0	220.0
<i>Juniperus osteosperma</i>	15	5	15	15	50.0

	Mean Cover Percent by Maturity Class				
<i>Pinus monophylla</i>	1.1	7.8	9.4	15.3	33.6
<i>Juniperus osteosperma</i>	0.2	0.5	3.9	9.2	13.8

	Mean Cover and Frequency of Non-tree Species	
	Cover %	20 x 20* Frequency %
<i>Artemisia arbuscula</i>	3.8	11.5
<i>Artemisia tridentata</i>		3.0
<i>Chrysothamnus viscidiflorus</i>		2.0
<i>Purshia tridentata</i>		t**
<i>Bromus tectorum</i>		19.5
<i>Sitanion hystrix</i>		10.0
<i>Bromus marginatus</i>		3.0
<i>Poa secunda</i>		t
<i>Cordylanthus ramosus</i>		6.5
<i>Allium acuminatum</i>		4.0
<i>Phlox longifolia</i>		4.0
<i>Calochortus nuttallii</i>		t
<i>Crepis occidentalis</i>		t
<i>Gayophytum ramosissium</i>		t

*Frame size in inches

**Trace

Table 56. Ground Cover Characteristics for the
Pinus monophylla/*Juniperus osteosperma*/
Artemisia arbuscula Community

<u>Material</u>	<u>Cover %</u>
Bare ground	31.0
Litter	28.5
Pavement	0.5
Rock	9.5
Vegetation	30.5

2. *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova* Community

This community is encountered on hills in the northwestern part of the watershed. It is usually bounded by the *A. nova*/*Bromus tectorum*, *A. nova*/*B. tectorum*/rock or *P. monophylla*/*J. osteosperma*/*A. tridentata* communities.

The mean annual precipitation for this community is 10.0 inches (Appendix A). Elevation is around 6100 to 6320 feet. The community is usually found on south or west slopes of 15 to 20 percent.

Pinyon (*P. monophylla*) and juniper (*J. osteosperma*) occur with an average density of 107.5 and 45.0 trees/acre and cover of 4.8 and 2.4 percent, respectively. The pinyon and juniper occur mostly in maturity class 1 with no juniper in maturity class 4 present. The young and vigorous pinyon and juniper indicate an increase of these trees in the community.

Black sagebrush (*A. nova*) and yellowbrush (*Chrysothamnus viscidiflorus*) have a constancy of 100 percent. They occur with 10.5 and 1.1 percent cover and frequency of 77.2 and 16.5 percent, respectively. Spiny hopsage (*Grayia spinosa*), bitterbrush (*Purshia tridentata*), Mormon tea (*Ephedra nevadensis*) and golden currant (*Ribes aureum*) are infrequent when present.

Cheatgrass (*Bromus tectorum*), squirreltail (*Sitanion hystrix*), Thurber needlegrass (*Stipa thurberiana*), and Sandberg bluegrass (*Poa secunda*) all have 100 percent constancy. Cheatgrass is the most frequent with 86.8 percent, squirreltail, Thurber needlegrass and Sandberg bluegrass occur with 15.0, 3.5 and 2.0 percent frequency, respectively.

Eriastrum diffusum, *Calochortus nuttallii* and *Erigeron pumilis* were present in all stands sampled with 17.3, 3.2 and trace frequency percentages, respectively. Other forbs, when present, had low frequency (Table 57). This community is probably a *P. monophylla*/*J. osteosperma*/*A. nova*/*Stipa thurberiana* habitat-type.

Vegetation accounts for 31.5 percent of the ground cover characteristics, bare ground for 26.5 percent, rock for 23.0 percent, litter for 12.0 percent, and pavement for 7.0 percent.

The soils at the macroplots where this community was sampled are members of a fine, mixed, frigid family of Mollic Halpargids (Appendix B-15) or fine, mixed, frigid family of Mollic Durargids (Appendix B-24).

Table 57. Species Cover, Frequency, Constancy and Density for the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova* Community

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	95.0	5.0	5.0	2.5	107.5
<i>Juniperus osteosperma</i>	30.0	12.5	2.5	-	45.0

	Mean Cover Percent by Maturity Class				
<i>Pinus monophylla</i>	1.2	0.5	1.6	1.5	4.8
<i>Juniperus osteosperma</i>	0.5	1.2	0.7	-	2.4

	Mean Cover Frequency and Constancy of Non-tree Species		
	Cover %	20 x 20* Frequency %	Constancy %
<i>Artemisia nova</i>	10.5	77.2	100
<i>Chrysothamnus viscidiflorus</i>	1.1	16.5	100
<i>Grayia spinosa</i>		1.8	50
<i>Purshia tridentata</i>		1.8	50
<i>Ephedra nevadensis</i>			50
<i>Ribes aureum</i>			50
<i>Bromus tectorum</i>		86.8	100
<i>Sitanion hystrix</i>		15.0	100
<i>Stipa thurberiana</i>		3.5	100
<i>Poa secunda</i>		2.0	100
<i>Eriastrum diffusum</i>		17.2	100
<i>Phlox longifolia</i>		4.8	50
<i>Gayophytum ramosissimum</i>		4.2	50
<i>Calochortus nuttallii</i>		3.2	100
<i>Astragalus</i> spp.		1.2	50
<i>Erigeron pumilis</i>			100
<i>Castilleja chromosa</i>			50
<i>Cortylanthus ramosus</i>			50

*Frame size in inches

Table 58. Ground Cover Characteristics for the
Pinus monophylla/*Juniperus osteosperma*/
Artemisia nova Community

<u>Material</u>	<u>Cover %</u>
Bare ground	26.5
Litter	12.0
Pavement	7.0
Rock	23.0
Vegetation	31.5

3. *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova*/*Chrysothamnus nauseosus* Community

This community has developed in the northwestern part of the watershed. It is bounded by the *P. monophylla*/*J. osteosperma*/*A. nova* or the *P. monophylla*/*J. osteosperma*/*A. tridentata* community.

The mean annual precipitation for this community is 9.2 inches (Appendix A). Elevation ranges from 5700 to 6100 feet. The community is found on southeast or east facing slopes of 8 to 17 percent.

Pinyon (*P. monophylla*) and juniper (*J. osteosperma*) are sparse (density of 20.0 and 5.0 trees/acre) with little foliage cover (0.9 and 1.3 percent, respectively). The pinyons are young, maturity classes 1 and 2, while the junipers are older, maturity class 3, and fewer in number.

Black sagebrush (*A. nova*) and rubber rabbitbrush (*C. nauseosus*) are dominant in the understory with 3.0 and 2.8 percent cover, and frequency values of 51.0 and 26.8 percent, respectively. Both species have 100 percent constancy. Big sagebrush (*A. tridentata*) and yellowbrush (*Chrysothamnus viscidiflorus*), when present, are infrequent.

Cheatgrass (*Bromus tectorum*) has a constancy of 100 and is the most frequent grass with 77.0 percent. Sandberg bluegrass (*Poa secunda*), squirreltail (*Sitanion hystrix*) and mat muhly (*Muhlenbergia richardsonis*) occur erratically with 2.0, 2.0 and 1.7 percent frequency, respectively.

All of the forbs have a constancy of 50 with *Gayophytum ramosissimum* the most frequent (25.0 percent). Other forbs have frequency values of 6.2 percent or less (Table 59). This community is probably a seral representative of the *P. monophylla*/*J. osteosperma*/*A. nova*/*Stipa thurberiana* habitat-type.

Vegetation accounts for 34.8 percent of the ground cover characteristics, rock for 26.0 percent, pavement for 20.8 percent, litter for 11.2 percent, and bare ground for 9.5 percent (Table 60).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Lithic Haplargids (Appendix B-9), or fine mixed, frigid family of Haplic Mollic Durargids (Appendix B-21).

Table 59. Species Cover, Frequency, Constancy and Density for the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova*/*Chrysothamnus nauseosus* Community

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	12.5	7.5	-	-	20.0
<i>Juniperus osteosperma</i>	-	-	5.0	-	5.0

	Mean Cover Percent by Maturity Class				
<i>Pinus monophylla</i>	0.2	0.7	-	-	0.9
<i>Juniperus osteosperma</i>	-	-	1.3	-	1.3

Mean Cover, Frequency and Constancy of Non-tree Species

	<u>Cover %</u>	<u>20 x 20* Frequency %</u>	<u>Constancy %</u>
<i>Artemisia nova</i>	3.0	51.0	100
<i>Chrysothamnus nauseosus</i>	2.8	26.8	100
<i>Artemisia tridentata</i>		2.2	50
<i>Chrysothamnus viscidiflorus</i>			50
<i>Bromus tectorum</i> (10 x 10)*		77.0	100
<i>Poa secunda</i>		2.0	50
<i>Sitanion hystrix</i>		2.0	50
<i>Muhlenbergia richardsonis</i>		1.7	50
<i>Gayophytum ramosissimum</i>		25.0	50
<i>Eriogonum densum</i>		6.2	50
<i>Phlox longifolia</i>		3.8	50
<i>Lappula redowskii</i>		2.1	50
<i>Allium acuminatum</i>		2.0	50
<i>Eriastrum diffusum</i>		1.8	50
<i>Eriogonum thomasi</i>		1.8	50
<i>Astragalus purshii</i>		1.8	50

* Frame size in inches

Table 60. Ground Cover Characteristics for the
Pinus monophylla/*Juniperus osteosperma*/
Artemisia nova/*Chrysothamnus nauseosus*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	7.5
Litter	11.2
Pavement	20.8
Rock	26.0
Vegetation	34.8

4. *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata* Community

This community occurs on hills or mountains in the northwestern and north central part of the watershed.

The mean annual precipitation for this community is 11.6 inches (Appendix A). Elevation is around 5500 to 6175 feet. The community is found on southeast facing slopes of 18 to 32 percent.

The most characteristic species in the community are pinyon (*P. monophylla*), juniper (*J. osteosperma*) and big sagebrush (*A. tridentata*). Respectively, they provide 22.5, 9.1 and 5.9 percent cover. A majority of the pinyon cover is by trees in maturity class 3, while most of the juniper cover is from trees in maturity class 4. Pinyon has an average density of 222.0 trees/acre and juniper has 37.0 trees/acre. Most of the pinyon are found in maturity class 1 with the juniper about evenly distributed among the 4 maturity classes. Big sagebrush is present in all stands with a frequency value of 28.5 percent. Bitterbrush (*Purshia tridentata*) is usually present with a cover of 1.0 percent and frequency of 5.3 percent. A large number of additional shrubs occur in small sporadic amounts throughout the community.

Cheatgrass (*Bromus tectorum*) and squirreltail (*Sitanion hystrix*) have 100 percent constancy and frequency of 38.8 and 14.7 percent, respectively. Thurber needlegrass (*Stipa thurberiana*), Idaho fescue (*Festuca idahoensis*) and Sandberg bluegrass (*Poa secunda*) are sparse.

Gayophytum ramosissimum, *Eriogonum thomasi*, *Phlox longifolia*, *Eriastrum diffusum*, *Astragalus* sp., *Lygodesmia spinosa* and *Calochortus nuttallii* have 100 percent constancy. Of these forbs *G. ramosissimum* and *E. thomasi* are the most frequent with 21.5 and 8.5 percent, respectively.

Erigeron pumilis has a constancy of 67 percent while all other forbs in the community have a constancy of 33 percent (Table 61). This community is probably a *P. monophylla*/*J. osteosperma*/*Stipa thurberiana* habitat-type.

Litter accounts for 34.0 percent of the ground cover characteristics, pavement for 25.8 percent, bare ground for 17.3 percent, vegetation for 17.2 percent, and rock for 5.7 percent (Table 62).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-32); fine, mixed, frigid family of Typic Argixerolls (Appendix B-34); or loamy-skeletal, mixed, frigid family of Pachic Argixerolls (Appendix B-36).

Table 61. Species Cover, Frequency, Constancy and Density
for the *Pinus monophylla*/*Juniperus osteosperma*/
Artemisia tridentata Community.

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	140.0	35.0	38.5	8.5	222.0
<i>Juniperus osteosperma</i>	8.5	8.5	11.5	8.5	37.0
Species	Mean Cover Percent by Maturity Class				
	1	2	3	4	Total
<i>Pinus monophylla</i>	1.8	3.4	12.1	5.2	22.5
<i>Juniperus osteosperma</i>	0.1	0.8	3.0	5.2	9.1
Mean Cover, Frequency and Constancy of Non-tree Species					
	20 x 20*				
	Cover %	Frequency %	Constancy %		
<i>Artemisia tridentata</i>	5.9	28.5	100		
<i>Purshia tridentata</i>	1.0	5.3	100		
<i>Cercocarpus ledifolius</i>			33		
<i>Chrysothamnus nauseosus</i>			33		
<i>Chrysothamnus viscidiflorus</i>			33		
<i>Ephedra nevadensis</i>			33		
<i>Eriogonum microthecum</i>			33		
<i>Prunus andersonii</i>			33		
<i>Ribes aureum</i>			33		
<i>Bromus tectorum</i>		38.8	100		
<i>Sitanion hystrix</i>		14.7	100		
<i>Stipa thurberiana</i>		6.0	67		
<i>Festuca octoflora</i>			33		
<i>Poa secunda</i>			33		
<i>Gayophytum ramosissimum</i>		21.5	100		
<i>Eriogonum thomasi</i>		8.5	100		
<i>Phlox longifolia</i>		3.7	100		
<i>Eriastrum diffusum</i>		2.8	100		
<i>Astragalus</i> sp.		2.5	100		
<i>Lygodesmia spinosa</i>		1.8	100		
<i>Calochortus nuttallii</i>		1.5	100		
<i>Erigeron pumilis</i>			67		
<i>Descurainia sophia</i>			33		
<i>Lappula redowskii</i>			33		
<i>Mentzelia multiflora</i>			33		
<i>Oenothera contorta</i>			33		
<i>Opuntia erinacea</i>			33		
<i>Phlox stansburii</i>			33		
<i>Navarretia</i> sp.			33		

*Frame size in inches

Table 62. Ground Cover Characteristics for the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	17.3
Litter	34.0
Pavement	25.8
Rock	5.7
Vegetation	17.2

Populus fremontii/*Salix geyeriana* Community

This community occurs as relatively small inclusions within a variety of different communities. It is found mostly along small creeks in the western part of the watershed.

The mean annual precipitation for this community is 9.2 inches (Appendix A). Elevation is upwards from 5460 feet. The community is found on northeast facing slopes of 1 percent.

Fremont cottonwood (*P. fremontii*) and geyer willow (*S. geyeriana*) are the most characteristic species in the community. Respectively, they account for 22.0 and 76.1 percent cover. Almost all of the cover is accounted for by older trees, however, geyer willow is more evenly distributed by maturity class than Fremont cottonwood. Fremont cottonwood and geyer willow have a density of 345.0 and 815.0 trees/acre. Most of these plants are younger (maturity class 1 for Fremont cottonwood and classes 1 and 2 for geyer willow). Pinyon (*P. monophylla*) and juniper (*J. osteosperma*) are also present in the community with 19.0 and 4.9 percent cover and density of 50.0 and 15.0 trees/acre, respectively.

Big sagebrush (*A. tridentata*) and cheatgrass (*Bromus tectorum*) are present with frequency values of 1.0 and 27.0 percent (Table 63). This community is probably a *P. fremontii*/grass-forb/*S. geyeriana* habitat-type.

Litter accounts for 40.5 percent of the ground cover characteristics, rock for 23.5 percent, bare ground for 12.5 percent, pavement for 11.0 percent, and vegetation for 10.5 percent (Table 64).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Cumulic Haploxerolls (Appendix B-41).

Table 63. Species Frequency and Density for the
Populus fremontii/*Salix geyeriana* Community

Species	Mean Density (Trees/A) by Maturity Class				
	1	2	3	4	Total
<i>Populus fremontii</i>	325.0	-	-	20.0	345.0
<i>Salix geyeriana</i>	500.0	200.0	40.0	75.0	815.0
<i>Pinus monophylla</i>	10.0	5.0	10.0	25.0	50.0
<i>Juniperus osteosperma</i>	-	5.0	5.0	5.0	15.0

	Mean Cover Percent by Maturity Class				
<i>Populus fremontii</i>	0.4	-	-	21.6	22.0
<i>Salix geyeriana</i>	2.8	4.3	10.4	58.6	76.1
<i>Pinus monophylla</i>	0.1	0.5	3.1	15.3	19.0
<i>Juniperus osteosperma</i>	-	0.5	1.3	3.1	4.9

	Mean Frequency of Non-tree Species	
	20 x 20*	
	Frequency %	
<i>Artemisia tridentata</i>	1.0	
<i>Bromus tectorum</i>	27.0	

* Frame size in inches

Table 64. Ground Cover Characteristics for the
Populus fremontii/*Salix geyeriana* Community

Material	Cover %
Bare ground	12.5
Litter	40.5
Pavement	11.0
Rock	23.5
Vegetation	10.5

Populus tremuloides/*Artemisia tridentata* Community

This community occurs as small inclusions within a variety of different communities in the western part of the watershed.

The mean annual precipitation for this community is 13.9 inches (Appendix A). Elevation is around 6350 feet. The community is found on concave northwest facing slopes of 9 percent.

Quaking aspen (*P. tremuloides*) is the dominant species with a density of 305.0 trees/acre and a frequency of 11.0 percent. Big sagebrush (*A. tridentata*) is dominant in the shrub layer with 7.9 percent cover and 67.5 percent frequency. Golden currant (*Ribes aureum*), snowberry (*Symphoricarpos vaccinioides*) and Woods rose (*Rosa woodsii*) are also present in the shrub layer. Respectively, they account for 4.2, 1.2 and trace percent cover and 6.0, 18.0 and 2.0 percent frequency.

Mountain brome (*Brome marginatus*) and squirreltail (*Sitanion hystrix*) are found in the community with very small frequency value. *Galium bifolium*, *Allium acuminatum* and *Chenopodium* sp. are the most frequent forbs with 97.5, 41.5 and 12.5 percent, respectively. A number of other forbs occur with frequency values of 3.0 percent or less (Table 65). This community is a seral representative of a *P. tremuloides*/grass-forb habitat-type.

Litter accounts for 51.0 percent of the ground cover characteristics, vegetation for 32.5 percent, bare ground for 8.5 percent, and pavement for 8.0 percent (Table 66).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Cumulic Haploxerolls (Appendix B-41).

Table 65. Species Cover, Frequency and Density for the
Populus tremuloides/*Artemisia tridentata*
 Community

<u>Species</u>	<u>Density (trees/acre)</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Populus tremuloides</i>	305.0	**	11.0
<i>Artemisia tridentata</i>		7.9	67.5
<i>Ribes aureum</i>		4.2	6.0
<i>Symphoricarpos vaccinioides</i>		1.2	18.0
<i>Rosa woodsii</i>			2.0
<i>Bromus marginatus</i>			1.5
<i>Sitanion hystrix</i>			t***
<i>Galium bifolium</i>			97.5
<i>Allium acuminatum</i>			41.5
<i>Chenopodium</i> sp.			12.5
<i>Viola adunca</i>			13.0
<i>Phacelia humilis</i>			2.5
<i>Descurainia sophia</i>			t
<i>Lappula redowskii</i>			t
<i>Lepidium perfoliatum</i>			t
<i>Lupinus</i> sp.			t
<i>Senecio integerrimus</i>			t

* Frame size in inches

** Cover not taken

*** Trace

Table 66. Ground Cover Characteristics for the
Populus tremuloides/*Artemisia tridentata*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	8.5
Litter	51.0
Pavement	8.0
Rock	0
Vegetation	32.5

Bailey greasewood (*Sarcobatus baileyi*) Communities

1. *Sarcobatus baileyi*/*Artemisia spinescens* Community

This community is encountered in the northeastern part of the watershed. The following communities are found adjacent to it at various places: *A. tridentata*/*B. tectorum*; *A. tridentata*/*E. nevadensis*; *S. baileyi*/*A. confertifolia* or *A. nova*/*B. tectorum*.

The mean annual precipitation for this community is 6.8 inches (Appendix A). Elevation is around 4900 to 4950 feet. The community occurs on north facing fans with 1 to 2 percent slope.

Bailey greasewood (*S. baileyi*) and bud sagebrush (*A. spinescens*) are the most conspicuous species. They are present in all stands with an average of 6.0 and 2.4 percent cover, and 26.0 and 53.5 percent frequency, respectively. Spiny hopsage (*Grayia spinosa*) is also present with 2.8 percent frequency. Yellowbrush (*Chrysothamnus viscidiflorus*) and Mormon tea (*E. nevadensis*), when found in the shrub layer, occur with small frequency values.

Squirreltail (*Sitanion hystrix*), cheatgrass (*B. tectorum*) and desert needlegrass (*Stipa speciosa*) have frequencies of 4.0, 2.0 and trace percentages.

A large variety of forbs are found throughout the community and most of them have 100 percent constancy. *Eriogonum densum* and *Lappula redowskii* are the most frequent with 46.8 and 44.2 percent. The other forbs have frequency percentages of 20.0 or less (Table 67). This community is a *S. baileyi*/*S. spinescens*/*Stipa speciosa* habitat-type.

Pavement accounts for most of the ground cover characteristics (72.0 percent), vegetation for 13.0 percent, litter for 8.0 percent, bare ground and rock each for 3.5 percent (Table 68).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, mesic family of Typic Haplargids (Appendix B-6), or very-fine, mixed, mesic family of Haplic Nadurargids (Appendix B-28).

Table 67. Species Cover, Frequency and Constancy
for the *Sarcobatus baileyi*/*Artemisia*
spinescens Community

Species	Cover %	20 x 20*	
		Frequency %	Constancy %
<i>Sarcobatus baileyi</i>	6.0	26.0	100
<i>Artemisia spinescens</i>	2.4	53.5	100
<i>Grayia spinosa</i>		2.8	100
<i>Chrysothamnus viscidiflorus</i>			50
<i>Ephedra nevadensis</i>			50
<i>Sitanion hystrix</i>		4.0	100
<i>Bromus tectorum</i>		2.0	50
<i>Stipa speciosa</i>			50
<i>Eriogonum densum</i>		46.0	100
<i>Lappula redowskii</i>		44.2	100
<i>Eriastrum diffusum</i>		20.0	100
<i>Navarretia</i> sp.		19.5	100
<i>Oenothera contorta</i>		16.5	100
<i>Gayophytum ramosissimum</i>		13.8	100
<i>Lepidium perfoliatum</i>		12.5	100
<i>Astragalus</i> sp.		4.8	100
<i>Kochia americana</i>		4.8	100
<i>Phacelia</i> sp.			50
<i>Eriogonum thomasi</i>			50

*Frame size in inches

Table 68. Ground Cover Characteristics for the
Sarcobatus baileyi/*Artemisia spinescens*
Community

Material	Cover %
Bare ground	3.5
Litter	8.0
Pavement	72.0
Rock	3.5
Vegetation	13.0

2. *Sarcobatus baileyi*/Atriplex confertifolia Community

This community has developed in the northern part of the watershed on the west fan above the main wash.

The mean annual precipitation for this community is 5.8 inches (Appendix A). Elevation is around 4720 to 4900 feet. The community occurs on southeast, east, southwest and northwest facing slopes of 1 to 3 percent.

Bailey greasewood (*S. baileyi*) and shadscale (*A. confertifolia*) are the dominant species with 100 percent constancy, cover of 4.3 and 2.4 percent, and frequency of 15.0 and 15.0 percent, respectively. A large number of shrubs are present in the community. Big sagebrush (*A. tridentata*), spiny hopsage (*Grayia spinosa*), Mormon tea (*Ephedra nevadensis*) and yellowbrush (*Chrysothamnus viscidiflorus*) are the most constant (75 percent).

Cheatgrass (*B. tectorum*) is the most frequent grass (25.0 percent) with 100 percent constancy. Indian ricegrass (*Oryzopsis hymenoides*) and squirreltail (*Sitanion hystrix*) have 100 percent constancy and 4.4 and 2.2 percent frequency. Mat muhly (*Muhlenbergia richardsonis*) occurs with 25 percent constancy and 3.5 percent frequency.

A large number of forbs are present in the community. *Eriastrum diffusum*, *Eriogonum* sp., *Navarretia* sp., *Astragalus* sp., *Oenothera multijuga* and *Salsola kali* var. *tenuifolia* occur in all stands with a frequency of 32.2, 28.1, 27.9, 5.0, 4.0 and 2.0 percent, respectively. Three species (*Eriogonum densum*, *Mentzelia multiflora* and *Amsinckia menziesii*) occur with 75 percent constancy, and 24.6, 13.0 and 2.4 percent frequency, respectively (Table 69). This community is probably a seral representative of a *S. baileyi*/*A. confertifolia*/*O. hymenoides* habitat-type.

Pavement accounts for 32.2 percent of the ground cover characteristics, bare ground 22.8 percent, rock for 19.5 percent, vegetation for 13.5 percent, and litter for 12.0 percent (Table 70).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-3); fine-loamy, mixed, mesic family of Typic Haplargids (Appendix B-6); fine-loamy, mixed, mesic family of Typic Durargids (Appendix B-17); or fine, mixed, mesic family of Typic Nadurargids (Appendix B-27).

Table 69. Species Cover, Frequency and Constancy
for the *Sarcobatus baileyi*/*Atriplex*
confertifolia Community

Species	20 x 20*		Constancy %
	Cover %	Frequency %	
<i>Sarcobatus baileyi</i>	4.3	15.0	100
<i>Atriplex confertifolia</i>	2.4	15.0	100
<i>Artemisia spinescens</i>		4.6	25
<i>Artemisia tridentata</i>		2.8	75
<i>Grayia spinosa</i>		2.5	75
<i>Ephedra nevadensis</i>		1.0	75
<i>Chrysothamnus viscidiflorus</i>			75
<i>Chrysothamnus nauseosus</i>			50
<i>Tetradymia glabrata</i>			50
<i>Artemisia nova</i>			25
<i>Eurotia lanata</i>			25
<i>Bromus tectorum</i>		25.0	100
<i>Oryzopsis hymenoides</i>		4.4	100
<i>Muhlenbergia richardsonis</i>		3.5	25
<i>Sitanion hystrix</i>		2.2	100
<i>Eriastrum diffusum</i>		32.2	100
<i>Eriogonum</i> sp.		28.1	100
<i>Navarretia</i> sp.		27.9	100
<i>Eriogonum densum</i>		24.6	75
<i>Mentzelia multiflora</i>		13.0	75
<i>Oenothera contorta</i>		6.1	50
<i>Astragalus</i> spp.		5.0	100
<i>Oenothera</i> sp.		4.9	50
<i>Malacothrix</i> sp.		4.9	25
<i>Oenothera multijuga</i>		4.0	100
<i>Arabis</i> sp.		3.9	50
<i>Amsinckia menziesii</i>		2.4	75
<i>Salsola kali</i> var. <i>tenuifolia</i>		2.0	100
<i>Chaenactis douglasii</i>			25
<i>Descurainia sophia</i>			25
<i>Erodium cicutarium</i>			25
<i>Eriogonum thomasi</i>			25
<i>Gayophytum ramosissimum</i>			25
<i>Lappula redowskii</i>			25
<i>Phacelia</i> sp.			25
<i>Oenothera andina</i>			25

*Frame size in inches

Table 70. Ground Cover Characteristics for the
Sarcobatus baileyi/Atriplex confertifolia
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	22.8
Litter	12.0
Pavement	32.2
Rock	19.5
Vegetation	13.5

3. *Sarcobatus baileyi/Atriplex confertifolia/Artemisia nova* Community

This community is located in the northeastern part of the watershed. It is usually bounded by the *A. nova/B. tectorum*/rock or *S. baileyi/A. confertifolia* communities.

The mean annual precipitation for this community is 6.4 inches (Appendix A). Elevation is around 4900 to 5000 feet. The community is found on northeast facing slopes of 6 to 10 percent.

The most characteristic species in the community are bailey greasewood (*S. baileyi*), shadscale (*A. confertifolia*), and black sagebrush (*A. nova*). Respectively they provide 3.0, 3.0 and 2.2 percent cover, and 13.5, 11.8 and 30.8 percent frequency. Bud sagebrush (*Artemisia spinescens*) is present in the shrub layer with 1.0 percent cover and 10.2 percent frequency. A few additional shrubs are found scattered through the community.

Three grasses are present with cheatgrass (*Bromus tectorum*) most frequently (60.8 percent). Squirreltail (*Sitanion hystrix*) and Indian ricegrass (*Oryzopsis hymenoides*) occur with 10.8 and 5.0 percent, respectively.

A fairly large number of forbs occur in the community with *Gayophytum ramosissimum*, *Eriogonum densum*, *Astragalus* sp. and *Lappula redowskii* the most frequent (32.2, 23.8, 21.5, and 21.0 percent, respectively) (Table 71). This community is probably a *S. baileyi/A. confertifolia/A. nova/O. hymenoides* habitat-type.

Pavement accounts for 44.2 percent of the ground cover characteristics, vegetation for 27.4 percent, bare ground for 16.2 percent, rock for 7.2 percent and litter for 5.0 percent (Table 72).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, mesic family of Haplic Durargids (Appendix B-20), or fine, mixed, mesic family of Typic Nadurargids (Appendix B-27).

Table 71. Species Cover, Frequency and Constancy for
the *Sarcobatus baileyi*/*Atriplex confertifolia*/
Artemisia nova Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Sarcobatus baileyi</i>	3.0	13.5	100
<i>Atriplex confertifolia</i>	3.0	11.8	100
<i>Artemisia nova</i>	2.2	30.8	100
<i>Artemisia spinescens</i>	1.0	10.2	100
<i>Chrysothamnus viscidiflorus</i>		2.5	50
<i>Grayia spinosa</i>		1.2	100
<i>Tetradymia spinosa</i>			50
<i>Bromus tectorum</i>		60.8	100
<i>Sitanion hystrix</i>		10.8	100
<i>Oryzopsis hymenoides</i>		5.0	100
<i>Gayophytum ramosissium</i>		32.2	100
<i>Eriogonum densum</i>		23.8	100
<i>Astragalus</i> sp.		21.5	100
<i>Lappula redowskii</i>		21.0	100
<i>Kochia americana</i>		17.5	100
<i>Amsinckia menziesii</i>		16.8	100
<i>Eriastrum diffusum</i>		11.2	100
<i>Oenothera cardiophylla</i>		7.0	100
<i>Naverretia</i> sp.		5.5	100
<i>Sphaeralcea coccinea</i>		5.2	100
<i>Phacelia</i> sp.		3.0	100
<i>Mentzelia multiflora</i>		1.5	50
<i>Abronia fragrans</i>		1.0	50
<i>Oenothera</i> sp.		1.0	50
<i>Descurainia sophia</i>			100
<i>Chaenactis douglasii</i>			50

*Frame size in inches

Table 72. Ground Cover Characteristics for the
Sarcobatus baileyi/Atriplex confertifolia/
Artemisia nova Community

<u>Material</u>	<u>Cover %</u>
Bare ground	16.2
Litter	5.0
Pavement	44.2
Rock	7.2
Vegetation	27.4

4. *Sarcobatus baileyi*/*Atriplex confertifolia*/
Chrysothamnus viscidiflorus Community

This community has developed in the northeastern part of the watershed. It is bounded on the south and west by the *A. nova*/*B. tectorum*/rock community, on the north by the *S. baileyi*/*A. spinescens* community and on the west by the *A. tridentata*/*B. tectorum* (Low) or *S. baileyi*/*C. viscidiflorus* community.

The mean annual precipitation for this community is 7.8 inches (Appendix A). Elevation is around 5050 feet. The community occurs on northeast facing slopes of 8 percent.

Bailey greasewood (*S. baileyi*), shadscale (*A. confertifolia*) and yellowbrush (*C. viscidiflorus*) are the dominant species in the community with 4.2, 3.8 and 3.3 percent cover, and 15.5, 41.0 and 42.0 percent frequency. Bud sagebrush (*A. spinescens*) and spiny hopsage (*G. spinosa*) are present with frequency of 10.5 and 1.5 percent.

Squirreltail (*S. hystrix*), cheatgrass (*B. tectorum*), and Indian ricegrass (*O. hymenoides*) occur with 10.0, 9.0 and 2.0 percent frequency, respectively.

The most frequent forbs are *Navarretia* sp., *Gayophytum ramosissimum*, *Amsinckia menziesii* and *Oenothera contorta* (15.0, 8.5, 6.5 and 5.5 percent, respectively). Additional forbs occur with frequency of 1.5 percent or less (Table 73). This community is probably a seral representative of a *S. baileyi*/*S. confertifolia*/*A. spinescens* habitat-type.

Pavement accounts for 70.0 percent of the ground cover characteristics, vegetation for 19.0 percent, litter for 10.5 percent, bare ground for 1.0 percent, and rock for 0.5 percent (Table 74).

The soil at the macroplot where this community was sampled is a member of a loamy-skeletal, mixed, mesic family of Mollic Camborthids (Appendix B-4).

Table 73. Species Cover and Frequency for the
Sarcobatus baileyi/*Atriplex confertifolia*/
Chrysothamnus viscidiflorus Community

Species	Cover %	20 x 20* Frequency %
<i>Sarcobatus baileyi</i>	4.2	15.5
<i>Atriplex confertifolia</i>	3.8	41.0
<i>Chrysothamnus viscidiflorus</i>	3.3	42.0
<i>Artemisia spinescens</i>		10.5
<i>Grayia spinosa</i>		1.5
<i>Sitanion hystrix</i>		10.0
<i>Bromus tectorum</i>		9.0
<i>Oryzopsis hymenoides</i>		2.0
<i>Navarretia</i> sp.		15.0
<i>Gayophytum ramosissimum</i>		8.5
<i>Amsinckia menziesii</i>		6.5
<i>Oenothera contorta</i>		5.5
<i>Castilleja chromasa</i>		1.5
<i>Eriogonum densum</i>		1.0
<i>Lappula redowskii</i>		1.0
<i>Machaeranthera canescens</i>		1.0
<i>Eriogonum thomasi</i>		t**
<i>Iva axillaris</i>		t

* Frame size in inches

** Trace

Table 74. Ground Cover Characteristics for the
Sarcobatus baileyi/*Atriplex confertifolia*/
Chrysothamnus viscidiflorus Community

Material	Cover %
Bare ground	1.0
Litter	10.5
Pavement	70.0
Rock	0.5
Vegetation	19.0

5. *Sarcobatus baileyi*/*Chrysothamnus viscidiflorus*
Community

This community is encountered in the northeastern part of the watershed. It is bounded by the *A. nova*/*B. tectorum*/rock community on the south, the *S. baileyi*/*A. confertifolia*/*C. viscidiflorus* community on the west, and the *A. tridentata*/*B. tectorum* (Low) community on the north and east.

The mean annual precipitation of this community is 7.4 inches (Appendix A). Elevation is around 5000 feet. The community occurs on northeast facing slopes of 5 percent.

Yellowbrush (*C. viscidiflorus*) and bailey greasewood (*S. baileyi*) are the dominant shrubs with 6.1 and 1.9 percent cover and 40.5 and 11.0 percent frequency. Bud sagebrush (*A. spinescens*) is present with 7.5 percent frequency, and spiny hopsage (*G. spinosa*) and snowberry (*Symphoricarpos* sp.) occur in trace amounts.

Cheatgrass (*B. tectorum*) and squirreltail (*S. hystrix*) occur with frequency values of 3.0 and 2.0 percent. A number of forbs occur in the community with *Navarretia* sp., *Gayophytum ramosissimum*, *Oenothera contorta*, *Eriastium diffusum*, and *Kochia americana* the most frequent (29.0, 16.0, 14.0, 11.5 and 8.5 percent, respectively) (Table 75). This community is probably a seral representative of a *S. baileyi*/*A. spinescens*/*Stipa speciosa* habitat-type where budsagebrush and *S. speciosa* has decreased and yellowbrush has increased.

Pavement accounts for 63.5 percent of the ground cover characteristics, vegetation for 22.5 percent, litter for 9.0 percent, and bare ground is 5.0 percent (Table 76).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, mesic family of Typic Camborthids (Appendix B-3).

Table 75. Species Cover and Frequency for the
Sarcobatus baileyi/*Chrysothamnus viscidiflorus*
 Community

Species	Cover %	20 x 20* Frequency %
<i>Chrysothamnus viscidiflorus</i>	6.1	40.5
<i>Sarcobatus baileyi</i>	1.9	11.0
<i>Artemisia spinescens</i>		7.5
<i>Grayia spinosa</i>		t**
<i>Symphoricarpos</i> sp.		t
<i>Bromus tectorum</i>		3.0
<i>Sitanion hystrix</i>		2.0
<i>Navarretia</i> sp.		29.0
<i>Gayophytum ramosissimum</i>		16.0
<i>Oenothera contorta</i>		14.0
<i>Eriastum diffusum</i>		11.5
<i>Kochia americana</i>		8.5
<i>Lappula redowskii</i>		3.5
<i>Descurainia sophia</i>		2.0
<i>Abronia fragrans</i>		t
<i>Astragalus</i> sp.		t
<i>Castilleja chromosa</i>		t
<i>Mentzelia multiflora</i>		t
<i>Sphaeralcea coccinea</i>		t

*Frame size in inches

**Trace

Table 76. Ground Cover Characteristics for the
Sarcobatus baileyi/*Chrysothamnus viscidiflorus*
 Community

Material	Cover %
Bare ground	5.0
Litter	9.0
Pavement	63.5
Rock	0.0
Vegetation	22.5

Sarcobatus vermiculatus Community.

This is a small community in the eastern part of the watershed. It is usually bounded by the *A. nova*/*B. tectorum* rock community on all sides but on the south where it is bounded by the *P. fremontii*/*S. geyeriana* community. It is found on alkali soils.

The mean annual precipitation for this community is 7.5 inches (Appendix A). Elevation is around 5300 feet. The community occurs on southwest facing slopes of 4 percent.

Black greasewood (*S. vermiculatus*) is the dominant species with 13.2 percent cover and 29.5 percent frequency. Shadscale is present in trace amounts only.

Cheatgrass (*B. tectorum*) occurs with 1.5 percent frequency. Poverty sumpweed (*Iva axillaris*) and flixweed tansy mustard (*Descurainia sophia*) have a frequency of 58.0 and 51.5 percent, respectively (Table 77). This community is probably a *S. vermiculatus* habitat-type.

Bare ground accounts for 48.5 percent of the ground cover characteristics, vegetation for 26.5 percent, litter for 20.5 percent, pavement for 4.0 percent, and rock for 0.5 percent (Table 78).

The soil at the macroplot where this community was sampled is a member of a fine, mixed, mesic family of Typic Nadurargids (Appendix B-26).

Table 77. Species Cover and Frequency for the
Sarcobatus vermiculatus Community

<u>Species</u>	<u>Cover %</u>	<u>20 x 20* Frequency %</u>
<i>Sarcobatus vermiculatus</i>	13.2	29.5
<i>Atriplex confertifolia</i>		t**
<i>Bromus tectorum</i>		1.5
<i>Iva axillaris</i>		58.0
<i>Descurainia sophia</i>		51.5

* Frame size in inches
** Trace

Table 78. Ground Cover Characteristics for the
Sarcobatus vermiculatus Community

<u>Material</u>	<u>Cover %</u>
Bare ground	48.5
Litter	20.5
Pavement	4.0
Rock	0.5
Vegetation	26.5

Sisymbrium altissimum Community

This community occurs mostly in the eastern part of the watershed as small inclusions around waterholes, and sheep bedding grounds.

The mean annual precipitation for this community is 7.0 inches (Appendix A). Elevation is around 5375 feet. The community occurs on all aspects of 10 percent slopes.

Shrubs that occur in this community are black sagebrush (*A. nova*), spiny hopsage (*G. spinosa*) and Mormon tea (*E. nevadensis*) with 9.5, 2.0 and 0.5 percent frequency.

Tumblemustard (*S. altissimum*) is the most frequent species (85.5 percent). Menzies fiddleneck (*Amsinckia menziesii*) and alfileria (*Erodium cicutarium*) occur with frequencies of 68.0 and 66.5 percent. A few additional forbs are present with frequencies of 4.5 percent or less (Table 79). This community is obviously a low seral community and is probably an *A. nova*/*O. hymenoides* habitat-type.

Pavement accounts for 42.0 percent of the ground cover characteristics, vegetation for 21.0 percent, rock for 15.5 percent, bare ground for 11.5 percent, and litter for 10.0 percent (Table 80).

The soil at the macroplot where this community was sampled is a member of a fine, mixed, frigid family of Mollic Haplargids (Appendix B-15).

Table 79. Species Frequency for the
Sisymbrium altissimum Community

<u>Species</u>	<u>20 x 20* Frequency %</u>
<i>Artemisia nova</i>	9.5
<i>Grayia spinosa</i>	2.0
<i>Ephedra nevadensis</i>	0.5
<i>Sisymbrium altissimum</i>	85.5
<i>Amsinckia menziesii</i>	68.0
<i>Erodium cicutarium</i>	66.5
<i>Eriogonum densum</i>	4.5
<i>Sphaeralcea coccinea</i>	1.5
<i>Gayophytum ramosissimum</i>	1.0
<i>Navarretia</i> sp.	t**

* Frame size in inches

** Trace

Table 80. Ground Cover Characteristics for the
Sisymbrium altissimum Community

<u>Material</u>	<u>Cover %</u>
Bare ground	11.5
Litter	10.0
Pavement	42.0
Rock	15.5
Vegetation	21.0

Tetradymia glabrata Community

This community has developed in the northern part of the watershed usually as small inclusions.

The mean annual precipitation for this community is 7.3 inches (Appendix A). Elevation is around 4585 to 4900 feet. The community occurs on west and northeast facing slopes of 18 to 24 percent.

Littleleaf horsebrush (*T. glabrata*) is the dominant shrub with 10.5 percent cover and 22.0 percent frequency. Mormon tea (*E. nevadensis*) and bailey greasewood (*S. baileyi*) occur with cover of 6.0 and 5.8 percent, and 9.8 and 3.2 percent frequency, respectively. A large number of additional shrubs, when present, occur in small varied frequency.

Cheatgrass (*B. tectorum*) and squirreltail (*S. hystrix*) occur in all stands with 48.5 and 10.0 percent frequency. Indian ricegrass (*O. hymenoides*), when present, occurs with 3.8 percent frequency.

Eriogonum densum, *Descurainia sophia*, *Metzelia multiflora* and *Eriogonum thomasi* are the most frequent forbs (28.5, 12.7, 12.5 and 11.0 percent, respectively). The other forbs in the community occur with 7.8 percent frequency or less (Table 81). This community is probably a *S. baileyi*/*O. hymenoides* habitat-type.

Pavement accounts for 39.0 percent of the ground cover characteristics, vegetation for 20.2 percent, rock for 19.8 percent, bare ground 12.8 percent and litter for 7.2 percent.

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, mesic family of Typic Durargids (Appendix B-16); or fine-loamy, mixed mesic family of Typic Durargids (Appendix B-17).

Table 81. Species Cover, Frequency and Constancy
for the *Tetradymia glabrata* Community

Species	20 x 20*		Constancy %
	Cover %	Frequency %	
<i>Tetradymia glabrata</i>	10.5	22.0	100
<i>Ephedra nevadensis</i>	6.0	9.8	100
<i>Sarcobatus baileyi</i>	5.8	3.2	100
<i>Grayia spinosa</i>	1.3	4.5	50
<i>Eriogonum aureum</i>	0.8	9.5	50
<i>Atriplex canescens</i>		5.0	50
<i>Artemisia nova</i>		2.5	50
<i>Artemisia tridentata</i>		2.0	50
<i>Chrysothamnus nauseosus</i>		1.5	50
<i>Artemisia spinescens</i>			50
<i>Chrysothamnus viscidiflorus</i>			50
<i>Bromus tectorum</i>		48.5	100
<i>Sitanion hystrix</i>		10.0	100
<i>Oryzopsis hymenoides</i>		3.8	50
<i>Eriogonum densum</i>		28.5	100
<i>Descurainia sophia</i>		12.7	50
<i>Mentzelia multiflora</i>		12.5	50
<i>Eriogonum thomasi</i>		11.0	50
<i>Cordylanthus ramosus</i>		7.8	50
<i>Navarretia</i> sp.		7.2	100
<i>Sphaeralcea coccinea</i>		6.8	50
<i>Amsinckia menziesii</i>		3.8	100
<i>Lappula redowskii</i>		1.8	100
<i>Oenothera cardiophylla</i>		1.5	50
<i>Oenothera contorta</i>		1.5	50
<i>Eriastrum diffusum</i>			100

* Frame size in inches

Table 82. Ground Cover Characteristics for the
Tetradymia glabrata Community

<u>Material</u>	<u>Cover %</u>
Bare ground	12.8
Litter	7.2
Pavement	39.0
Rock	19.8
Vegetation	20.2

DISCUSSION AND MANAGEMENT SUITABILITIES

Management Areas

The *A. tridentata*/*B. tectorum* (High), *A. tridentata*/*J. balticus*, *A. tridentata*/*P. monophylla*, *Carex* sp./*J. balticus*, *P. monophylla* and *P. monophylla*/*A. tridentata* communities in the watershed are suitable for range improvements. All other communities were too rocky, too steep, too small for mechanical methods or too dry for known treatment methods; and insufficient frequency of perennial grass to warrant spraying.

Range Rehabilitation and Improvement:

The *A. tridentata*/*B. tectorum* (High) community occurs in the southern part of the watershed on east and northeast facing fans of 1 to 6 percent and Mollic Haplargids and Typic Argixerolls soils. Pavement cover accounts for 38.8 percent of the ground cover with very little rock cover. The mean annual precipitation is 11.2 inches. This community could be plowed and seeded to *Agropyron desertorum*.

In the southern part of the watershed on northeast facing slopes of 4 percent, the *A. tridentata*/*J. balticus* community is found. It is a degraded meadow that is free from rocks and occurs on Fluventic Haplaquolls. This community can be plowed and drilled to *Agropyron intermedium*.

The *A. tridentata*/*P. monophylla* community has resulted from the burning of a *P. monophylla*/*A. tridentata* community. It occurs in the western part of the watershed on northeast facing slopes of 3 percent. There is very little rock and pavement cover, and soils are Typic Argixerolls. This community could be plowed and drilled to either *Agropyron intermedium*, *Agropyron trichophorum* or as a mixture with *Purshia tridentata*.

At various places in the southeastern part of the watershed on 3 to 11 percent slopes, the *Carex* sp./*Juncus balticus* community has developed. These meadows have a good grass, sedge and rush cover, however, they also have sagebrush encroachment, *Iris missouriensis* and *Verbascum thapsus* present. These meadows should be sprayed, fenced and check dams installed where necessary to raise the water table.

The *P. monophylla* and *P. monophylla*/*A. tridentata* communities are found in the western part of the watershed on mountains, hills, and undulating slopes of 4 to 60 percent with east, northeast, north and southeast aspects. Rock cover is less than 11.0 percent and the mean

annual precipitation is 12.4 and 14.4 inches. On the more gentle slopes these communities could be chained. We recommend that chaining be done in two directions with aerial seeding of either *A. intermedium*, *A. trichophorum* or a mixture with *Purshia tridentata* between chainings.

Management by Grazing:

The other communities in the watershed should be grazed to maintain the present forage and in most cases to improve the forage. Thus some form of rest-rotation grazing system is suggested for the watershed.

Ecological Interpretations

Livestock use in the watershed has been responsible for the depletion of the more palatable grass and browse stands, and the invasion or increase of undesirable plants in most communities. The result has been an apparent decrease in cover, frequency, and productivity of the more desirable forage species. Some of these communities are in pristine condition while others are seral. Vegetation and soils association table (Appendix C) is discussed below.

Near the top of the mountains in the western part of the watershed, the *Artemisia arbuscula/Poa secunda* community is encountered. It occurs on shallow (10 inches to lithic contact) soils with clay argillic horizons, mixed mineralogy and a mollic epipedon. This community is probably a seral representative of an *A. arbuscula/Festuca idahoensis* habitat-type.

The *Artemisia nova/Bromus tectorum* community occurs mostly on fans in the central and northwestern part of the watershed. It is found on soils with a clay argillic horizon, mixed mineralogy and is a mollic intergrade with a duripan. This community is a low seral *A. nova/Oryzopsis hymenoides* habitat-type that has been "over grazed" resulting in a decrease of *O. hymenoides*, an increase of *Sitanion hystrix*, and an invasion of *B. tectorum* and a number of forbs. On rocky hills mostly in the southeast and northern part of the watershed, the *Artemisia nova/Bromus tectorum*/rock community is found. It occurs on soils with either a clay or clayey-skeletal argillic or clay natric horizon, with mixed mineralogy, and is a mollic intergrade with or without a duripan. This community is probably a low seral *A. nova/Oryzopsis hymenoides* habitat-type.

In the northern part of the watershed at lower elevations, the *Artemisia tridentata/Bromus tectorum* (Low) community has developed. It is found on soils with loamy-skeletal, clayey-skeletal and clay argillic

horizons, mixed mineralogy and are typic or mollic intergrades with or without a duripan. This community is a low seral *A. tridentata*/*Oryzopsis hymenoides* habitat-type where, due to grazing, *O. hymenoides* has decreased, *S. hystrix* increased, and *B. tectorum* and a number of annual forbs have invaded.

The *Artemisia tridentata*/*Bromus tectorum* (High) community is found in the southern part of the watershed at higher elevations than the *A. tridentata*/*B. tectorum* (Low) community. It occurs on soils with fine-loamy argillic horizons, mixed mineralogy and are classified as mollic intergrades or have mollic epipedons. This community is a low seral representative of an *A. tridentata*/*Stipa thurberiana* habitat-type.

The *Artemisia tridentata*/*Dalea polyadenia*, *D. polyadenia*, *A. tridentata*/*Ephedra nevadensis*, *E. nevadensis* and *E. nevadensis*/*Chrysothamnus viscidiflorus*/*Sarcobatus baileyi* communities are encountered in the northern part of the watershed in the main drainage. They occur on sandy soils with mixed mineralogy and without diagnostic subsurface horizons. The *A. tridentata*/*D. polyadenia* and *D. polyadenia* communities are probably seral representatives of a *D. polyadenia*/*Oryzopsis hymenoides* habitat-type, while the *A. tridentata*/*E. nevadensis* community is an *A. tridentata*/*E. nevadensis*/*Oryzopsis hymenoides* habitat-type. The *E. nevadensis* and *E. nevadensis*/*C. viscidiflorus*/*S. baileyi* communities are probably representatives of a *E. nevadensis*/*Oryzopsis hymenoides* habitat-type, where *O. hymenoides* has decreased and *C. viscidiflorus* and *S. baileyi* have increased in the transitional *E. nevadensis*/*C. viscidiflorus*/*S. baileyi* community.

On hills, fans and drainage bottoms in the northern and eastern part of the watershed, the *Artemisia tridentata*/*Grayia spinosa* community has developed. It occurs on coarse-loamy, mixed mineralogy soils with a cambic horizon, also on soils with loamy-skeletal argillic horizons, mixed mineralogy and lithic contact usually within 17 inches of the surface. The community is probably a seral representative of an *A. tridentata*/*Grayia spinosa*/*Oryzopsis hymenoides* habitat-type.

The *Artemisia tridentata*/*Juncus balticus* and *Carex* sp./*J. balticus* communities usually occur as inclusions in the southern part of the watershed. They are found on a loamy-skeletal soil with mixed mineralogy, a mollic epipedon and organic matter that does not decrease regularly with depth. The *Carex* sp./*J. balticus* community, in addition, is found on a coarse-loamy soil with mixed mineralogy and a thick mollic epipedon (27 inches). Both of these soils are saturated with water at some period during the year as evidenced by mottles in the lower epipedon. These two communities are probably low seral representatives of an *Elymus triticoides*/*Carex* sp. habitat-type.

At higher elevations in the western part of the watershed the *Artemisia tridentata*/*Symphoricarpos vaccinoides* community has developed. It occurs on coarse-loamy soils with mixed mineralogy, mollic epipedons and without diagnostic subsurface horizons. This community might be described as a *S. vaccinoides*/*A. tridentata*/*Bromus marginatus* habitat-type.

On fans and hillsides in the northern part of the watershed, the *Atriplex confertifolia* community is encountered. It is found on soils with clayey-skeletal argillic or clay natric horizons, mixed mineralogy and a duripan. This community is probably an expression of the *A. confertifolia*/*Oryzopsis hymenoides* habitat-type.

The *Atriplex confertifolia*/*Artemisia spinescens* community has developed on hills at lower elevations and on fans at higher elevations. It occurs on soils with a clayey-skeletal or loamy-skeletal argillic horizon, or a clay natric horizon, mixed mineralogy and with a duripan or lithic contact. This community is probably an *A. confertifolia*/*A. spinescens* habitat-type.

Near the top of the mountains in the western part of the watershed the *Cercocarpus ledifolius*/*Artemisia tridentata* community occurs. It is found on coarse-loamy soils with mixed mineralogy, mollic epipedons and without diagnostic subsurface horizons. This community is probably a seral expression of a *C. ledifolius*/*Amelanchier alnifolia*/*Stipa lettermani* habitat-type.

The *Chrysothamnus nauseosus*/*Artemisia nova*/*Bromus tectorum* community represents a seral stage of the *A. nova*/*Oryzopsis hymenoides* habitat-type which has been severely "over-grazed". *O. hymenoides* is no longer found in the community and *A. nova* occurs in low vigor with low frequency values. Overgrazing has allowed *C. nauseosus* to increase and *B. tectorum* to invade. It occurs in the north central part of the watershed, typically on soils with clay or fine-loamy argillic horizons, mixed mineralogy and are mollic intergrades with or without duripans.

In the northern part of the watershed, the *Chrysothamnus viscidiflorus* community has developed in an area used for a sheep bedding ground. It is probably a seral representative of the *Atriplex confertifolia*/*Artemisia spinescens* habitat-type. It occurs on soils with clay argillic horizons, mixed mineralogy and without a duripan.

The *Eurotia lanata* community occurs in the north central part of the watershed as inclusions in the drainage bottoms. It is found on coarse-loamy soils with mixed mineralogy and without diagnostic subsurface horizons. This community is probably a seral representative of an *E. lanata*/*Oryzopsis hymenoides* habitat-type.

In the northern part of the watershed on northeast facing slopes the *Grayia spinosa*/*Artemisia nova*/*Stipa speciosa* community has developed. It occurs on soils with clay argillic horizons, mixed mineralogy, mollic intergrades and duripans. This community is probably a *G. spinosa*/*A. nova*/*S. speciosa* habitat-type.

In northeast facing drainage bottoms in the eastern part of the watershed the *Grayia spinosa*/*Chrysothamnus viscidiflorus* community occurs. This community has received heavy grazing use which has allowed *C. viscidiflorus* to increase and a number of annual forbs to invade. This community is probably a low seral representative of a *G. spinosa*/*Artemisia spinescens* habitat-type. It is found on loamy-skeletal soils with a cambic horizon and mixed mineralogy which are classified as mollic intergrades.

The *Pinus monophylla* community occurs in the western part of the watershed on north and northeast facing slopes. It is usually found on coarse-loamy or loamy-skeletal soils with mollic epipedons that may be 20 inches or more thick, mixed mineralogy and without diagnostic subsurface horizons. It may occur, however, on soils with fine-loamy argillic horizons with mollic epipedons and mixed mineralogy. This community is a *P. monophylla* habitat-type.

On mountains, hills and undulating slopes in the western part of the watershed the *Pinus monophylla*/*Artemisia tridentata* and *Artemisia tridentata*/*P. monophylla* communities have developed. The *A. tridentata*/*P. monophylla* community has resulted from burning of the *P. monophylla*/*A. tridentata* community. Both communities are a *P. monophylla*/*A. tridentata* habitat-type. They both occur on soils with clay argillic horizons, mollic epipedons and mixed mineralogy. In addition, the *P. monophylla* community occurs on loamy-skeletal and coarse-loamy soils with mollic epipedons, mixed mineralogy and no diagnostic subsurface horizons. It may be found, however, on soils with loamy-skeletal argillic horizons and mixed mineralogy which are classified as mollic intergrades.

The *Pinus monophylla*/*Symphoricarpos vaccinoides*/*Artemisia tridentata* community has developed in the western part of the watershed on northeast facing slopes. It is found on coarse-loamy soils with mollic epipedons, mixed mineralogy and without diagnostic subsurface horizons. This community is probably a *P. monophylla*/*S. vaccinoides*/*A. tridentata*/*Stipa lettermani* habitat-type.

In the area of Sunrise Pass in the western part of the watershed the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula* community is encountered. It occurs as a representative of the *P. monophylla*/*J. osteosperma*/*A. arbuscula*/*Bromus marginatus* habitat-type on soils with a clay argillic horizon, mollic epipedon, mixed mineralogy and can be described as vertic intergrades.

On hills in the northwestern part of the watershed, the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova* and *P. monophylla*/*J. osteosperma*/*A. nova*/*C. nauseosus* had increased and *Bromus tectorum* and other annuals have invaded as a result of overgrazing. Both of these communities are representatives of the *P. monophylla*/*J. osteosperma*/*A. nova*/*Stipa lettermani* habitat-type. They are found on soils with loamy-skeletal or clay argillic horizons, mixed mineralogy that are classified as mollic intergrades with or without a duripan.

The *P. monophylla*/*J. osteosperma*/*A. tridentata* and *B. tectorum* communities occur on hills or mountains in the northwestern and central part of the watershed. Both of these communities are representative of the *P. monophylla*/*J. osteosperma*/*A. tridentata*/*Stipa lettermani* habitat-type where the *B. tectorum* community has resulted from a burn and most of the A horizon has been eroded. They are found on soils with a loamy-skeletal or clay argillic horizon, mollic epipedons that may or may not be more than 20 inches thick and mixed mineralogy.

Mostly along small streams in the western part of the watershed the *Populus fremontii*/*Salix geyeriana* community is encountered. It occurs on coarse-loamy soils with a mollic epipedon 20 inches thick, mixed mineralogy and without diagnostic subsurface horizons. This community is probably a seral representative of a *P. fremontii*/grass-forb habitat-type.

On fans in the northeastern part of the watershed the *Sarcobatus baileyi*/*Artemisia spinescens* community has developed. It occurs on soils with a fine-loamy argillic or clay natric horizon, mixed mineralogy, with or without a duripan. This community is a representative of a *S. baileyi*/*A. spinescens*/*Stipa speciosa* habitat-type.

The *Sarcobatus baileyi*/*Atriplex confertifolia* and *S. baileyi*/*A. confertifolia*/*Chrysothamnus viscidiflorus* communities occur in the northwestern part of the watershed. They are probably seral representatives of a *S. baileyi*/*A. confertifolia*/*Oryzopsis hymenoides* habitat-type. These communities occur either on coarse-loamy or loamy-skeletal soils with mixed mineralogy, cambic horizon and may or may not be classified as mollic intergrades.

In the northern part of the watershed on northeast facing slopes the *Sarcobatus baileyi*/*Atriplex confertifolia*/*Artemisia nova* is encountered. It occurs on soils with clay argilllc or clay natric horizons, mixed mineralogy and a duripan. This community is probably a *S. baileyi*/*A. confertifolia*/*A. nova*/*Oryzopsis hymenoides* habitat-type.

The *Sarcobatus baileyi*/*Chrysothamnus viscidiflorus* community is encountered in the northeastern part of the watershed. It occurs on coarse-loamy soils with mixed mineralogy and a cambic horizon. This community is probably a representative of a *S. baileyi*/*Oryzopsis hymenoides* habitat-type, where *C. viscidiflorus* has increased and *O. hymenoides* has decreased as a result of overgrazing.

The *Sarcobatus vermiculatus* is a small community that is found in the eastern part of the watershed. It occurs on soils that have a clay natric horizon, mixed mineralogy with the surface horizon eroded. This community is located around a spring and as a result has received heavy livestock use. This community is probably a seral representative of a *S. vermiculatus* habitat-type.

On sheep bedding grounds and around watering holes, mostly in the eastern part of the watershed, the *Sisymbrium altissimum* community has developed. This community was sampled on soils with clay argillic horizons, mixed mineralogy and classified as mollic intergrades, and is probably an *Artemisia nova*/*Oryzopsis hymenoides* habitat-type.

The *Tetradymia glabrata* community is encountered on slopes in the northern part of the watershed. This community has resulted from overgrazing and is probably a *Sarcobatus baileyi*/*Oryzopsis hymenoides* habitat-type. It is found on soils with loamy-skeletal and fine-loamy argillic horizons mixed mineralogy and duripans.

CLIMAXES

Climax as used in this report is defined as the kind of community capable of perpetuation under the prevailing climatic, edaphic, physiographic, biotic or pyric condition. This definition is in accordance with the polyclimax concept where several climaxes constitute the vegetation in an area as the result of succession.

Climatic climax develops on land (moderately rolling to level) that is neither excessively or inadequately drained, so that the major environmental conditions affecting organisms are climatic. Physiographic climax is determined in large measure by the nature of the topography (land relief). Edaphic climax is determined largely by the nature of the soil. A physiographic-edaphic climax is determined mostly by both topography and soils. A biotic climax is determined by the incidence and maintenance of a decisive "biotic factor" such as the continuous heavy grazing by animals. Pyric climax is determined by any

association that maintains its composition and structure only as a consequence of periodic burning (Hanson, 1962).

Most all of the communities in the watershed have been affected by grazing use and areas of relatively undisturbed vegetation are not common. Consequently, a majority of the communities are biotic climaxes. For this reason an estimate of the climax of each community is based on their present condition and probable habitat-type (Table 83).

RECREATION

The watershed is located fairly close to Yerington and Carson City. If recreation development in the general area was felt necessary, Churchill Canyon Watershed would be a compatible location. The basin has the advantage of several small intermittent streams and a number of small perennial springs. Fremont cottonwood, quaking aspen, pinyon and juniper are found in the watershed, and would provide shade and excellent areas for camping and picnic grounds.

The basin is scenic and provides deer and sagegrouse hunting. It is a good area for Pinyon Pine nut gathering and Christmas tree harvesting. The grandeur of the vegetation, topographic features, and wide open spaces may also attract a certain type of recreationist.

Table 83. Type of climax associated with the probable habitat-types and present biotic communities in the Churchill Canyon Watershed

		Type of Climax					
	Probable Habitat-type and Biotic Communities	Climatic	Physio-graphic	Edaphic	Physio-graphic	Biotic	Pyric
A ^a	<i>Artemisia arbuscula/Festuca idahoensis</i>	:	:	:	:	:	:
	1 ^b <i>A. arbuscula/Poa secunda</i>	:	:	:	:	x	:
B ^a	<i>Artemisia nova/Oryzopsis hymenoides</i>	:	:	:	:	:	:
	1 ^b <i>A. nova/Bromus tectorum</i>	:	:	:	:	:	:
	2 ^b <i>A. nova/B. tectorum/rock</i>	:	:	:	:	x	:
	3 ^b <i>Chrysothamnus nauseosus/A. nova/B. tectorum</i>	:	:	:	:	x	:
	4 ^b <i>Sisymbrium altissimum</i>	:	:	:	:	x	:
C ^a	<i>Artemisia tridentata/Ephedra nevadensis/O. hymenoides</i>	:	:	:	:	:	:
	1 ^b <i>A. tridentata/E. nevadensis</i>	:	:	:	:	:	x
D ^a	<i>Artemisia tridentata/Grayia spinosa/O. hymenoides</i>	:	:	:	:	:	:
	1 ^b <i>A. tridentata/G. spinosa</i>	:	:	:	:	:	x
E ^a	<i>Artemisia tridentata/Oryzopsis hymenoides</i>	:	:	:	:	:	:
	1 ^b <i>A. tridentata/B. tectorum (Low)</i>	:	:	:	:	:	x
F ^a	<i>Artemisia tridentata/Stipa thurberiana</i>	:	:	:	:	:	:
	1 ^a <i>A. tridentata/B. tectorum (High)</i>	:	:	:	:	:	x
G ^{ab}	<i>Atriplex confertifolia/Artemisia spinescens</i>	:	:	:	:	:	:
	1 ^b <i>Chrysothamnus viscidiflorus</i>	:	:	:	:	:	x
H ^a	<i>Atriplex confertifolia/Oryzopsis hymenoides</i>	:	:	:	:	:	:
	1 ^b <i>A. confertifolia</i>	:	:	:	:	:	x
I ^a	<i>Cercocarpus ledifolius/Amelanchier alnifolia/Stipa lettermanii</i>	:	:	:	:	:	:
	1 ^b <i>C. ledifolius/Artemisia tridentata</i>	:	:	:	:	:	x

[illegible]

Probable Habitat-type and Biotic Communities		Type of Climax							
		Climatic	Physio- graphic	Physio- graphic	Physio- graphic	Climatic	Physio- graphic	Physio- graphic	Physio- graphic
		Edaphic	Edaphic	Edaphic	Edaphic	Edaphic	Edaphic	Edaphic	Edaphic
		Biotic	Biotic	Biotic	Biotic	Biotic	Biotic	Biotic	Biotic
		Pyric	Pyric	Pyric	Pyric	Pyric	Pyric	Pyric	Pyric
U ^a	<i>P. monophylla</i> /J. osteosperma/A. tridentata/Stipa thurberiana								
	1 ^b <i>Bromus tectorum</i>								
	2 ^b <i>P. monophylla</i> /J. osteosperma/A. tridentata								
V ^a	<i>Populus fremontii</i> /grass-forb/ <i>Salix geyeriana</i>								
	1 ^b <i>P. fremontii</i> /S. geyeriana								
W ^a	<i>Populus tremuloides</i> /grass-forb								
	1 ^b <i>P. tremuloides</i> /Artemisia tridentata								
X ^a	<i>Sarcobatus baileyi</i> /Artemisia spinescens/Stipa speciosa								
	1 ^b <i>S. baileyi</i> /A. spinescens								
Y ^a	<i>S. baileyi</i> /Atriplex confertifolia/O. hymenoides								
	1 ^b <i>S. baileyi</i> /A. confertifolia								
	2 ^b <i>S. baileyi</i> /A. confertifolia/C. viscidiflorus								
Z ^a	<i>S. baileyi</i> /A. confertifolia/A. nova/O. hymenoides								
	1 ^b <i>S. baileyi</i> /A. confertifolia/A. nova								
A1 ^a	<i>Sarcobatus baileyi</i> /Oryzopsis hymenoides								
	1 ^b <i>S. baileyi</i> /C. viscidiflorus								
	2 ^b <i>Tetradymia glabrata</i>								
B1 ^{ab}	<i>Sarcobatus vermiculatus</i>								
C1 ^a	<i>Symphoricarpos vaccinioides</i> /A. tridentata/B. marginatus								
	1 ^a <i>A. tridentata</i> /S. vaccinioides								

a Habitat-type

b Biotic community

ab Habitat-type and biotic community

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APPENDIX A. Precipitation Data for the Churchill
Canyon Watershed

<u>Rain can</u>	<u>Annual Precipitation* (Inches)</u>
1	6.8
2	6.2
3	5.8
4	7.8
5	7.5
6	6.0
7	8.1
8	11.2
9	13.7
10	14.4
11	13.9
12	9.2
13	10.7
14	8.0
15	6.4
16	7.0
Mean	8.9

* Annual precipitation is based on 4 consecutive hydrologic years (October 1 to September 30), 1963-1967.

APPENDIX A (cont'd)

<u>Community</u>	<u>Annual* Precipitation (Inches)</u>
<i>Artemisia arbuscula/Poa secunda</i>	13.9
<i>Artemisia nova/Bromus tectorum</i>	9.2
<i>A. nova/B. tectorum (rock)</i>	7.6
<i>Artemisia tridentata/B. tectorum (Low)</i>	6.8
<i>A. tridentata/B. tectorum (High)</i>	11.2
<i>A. tridentata/Dalea polyadenia</i>	6.8
<i>A. tridentata/Ephedra nevadensis</i>	6.6
<i>A. tridentata/Grayia spinosa</i>	6.9
<i>A. tridentata/Juncus balticus</i>	11.2
<i>A. tridentata/Pinus monophylla</i>	14.4
<i>A. tridentata/Symphoricarpos vaccinioides</i>	13.9
<i>Atriplex confertifolia</i>	6.3
<i>A. confertifolia/Artemisia spinescens</i>	7.3
<i>Bromus tectorum</i>	10.7
<i>Carex sp./J. balticus</i>	11.2
<i>Cercocarpus ledifolius/A. tridentata</i>	13.9
<i>Chrysothamnus nauseosus/A. nova/B. tectorum</i>	7.8
<i>Chrysothamnus viscidiflorus</i>	6.8
<i>Dalea polyadenia</i>	6.8
<i>Ephedra nevadensis</i>	6.5
<i>E. nevadensis/C. viscidiflorus/Sarcobatus baileyi</i>	6.2
<i>Eurotia lanata</i>	5.8
<i>Grayia spinosa/A. nova/Stipa spèciosa</i>	8.0
<i>G. spinosa/C. viscidiflorus</i>	7.0
<i>Pinus monophylla</i>	14.4
<i>P. monophylla/A. tridentata</i>	12.4
<i>P. monophylla/Symphoricarpos vaccinioides/A. tridentata</i>	14.4
<i>P. monophylla/Juniperus osteosperma/A. arbuscula</i>	13.9
<i>P. monophylla/J. osteosperma/A. nova</i>	10.0

APPENDIX A (cont'd)

<u>Community</u>	<u>Annual* Precipitation (Inches)</u>
<i>P. monophylla/J. osteosperma/A. nova/C. nauseosus</i>	9.2
<i>P. monophylla/J. osteosperma/A. tridentata</i>	11.6
<i>Populus fremontii/Salix geyeriana</i>	9.2
<i>Populus tremuloides/A. tridentata</i>	13.9
<i>Sarcobatus baileyi/A. spinescens</i>	6.8
<i>S. baileyi/A. confertifolia</i>	5.8
<i>S. baileyi/A. confertifolia/A. nova</i>	6.4
<i>S. baileyi/A.confertifolia/C. viscidiflorus</i>	7.8
<i>S. baileyi/C. viscidiflorus</i>	7.4
<i>Sarcobatus vermiculatus</i>	7.5
<i>Sisymbrium altissimum</i>	7.0
<i>Tetradymia glabrata</i>	7.3

* Annual precipitation is based on rain cans in or near each community and on four consecutive hydrologic years (October 1 to September 30), 1963-1967

APPENDIX B. Soil Families and Subgroups Associated
with the Churchill Canyon Watershed Plant
Communities

APPENDIX B-1

Sandy, mixed, mesic family of Typic Torripsamments

Typically these soils have a light grayish brown to light gray ochric epipedon over a massive sandy C horizon. Thickness of the ochric epipedon ranges from 3 to 5 inches and the thickness of the C horizon is usually 31 inches plus. Reaction of the solum is neutral.

These soils are usually found at elevations from 4610 to 5000 feet and are associated with the *Artemisia tridentata*/*Ephedra nevadensis*, *A. tridentata*/*Dalea polyadenia*, *D. polyadenia*, *E. nevadensis* and *E. nevadensis*/*Chrysothamnus viscidiflorus*/*Sarcobatus baileyi* communities. They are found in drainage bottoms on all aspects of 0 to 2 percent slopes. The macrorelief is undulating or flat and the microrelief is uniform. These soils belong to the A hydrologic group and have a profile available water holding capacity of 2.9 inches. Stoniness class is 0 to 2.

- A 11 0 - 1½" Light brownish gray (10YR6/2) sand, dark brown (10YR3/3) moist; single grain; loose, loose, non-sticky, nonplastic; organic matter 0.6 percent, conductivity 0.15 mmhos., cation exchange capacity 9.0 meq.; noneffervescent; neutral (pH 6.6); clear smooth boundary.
- A 12 1½ - 5" Light gray (10YR7/2) sandy loam, dark grayish brown (10YR4/2) moist; moderate medium platy; slightly hard, very friable, nonsticky, nonplastic; noneffervescent; vesicular pores; clear smooth boundary.
- C 5-36"± Light brownish gray (10YR6/2) gravelly sand, dark yellowish brown (10YR3/4) moist; massive, soft, very friable, nonsticky, nonplastic; noneffervescent.

APPENDIX B-2

Coarse-loamy, mixed, mesic, nonacid family of Typic Torriorthents

Typically these soils have a light brownish gray ochric epipedon over a massive fine sandy loam texture C horizon. The ochric epipedon is 6 inches thick and the thickness of the C horizon is 30 inches plus. Reaction of the solum is mildly alkaline.

These soils are found at elevations around 4825 feet and associated with the *Eurotia lanata* community. They are found in drainage bottoms on southeast aspects of 1 percent slope. The macrorelief is flat and the microrelief is uniform. These soils belong to the B hydrologic group and have a profile available water holding capacity of 3.6 inches. Stoniness class is 0.

- A 1 0-6" Light brownish gray (10YR6/2) fine sandy loam, dark yellowish brown (10YR3/4) moist; weak medium platy; slightly hard, very friable, nonsticky, nonplastic; organic matter 0.6 percent, conductivity 0.35 mmhos., cation exchange capacity 7.5 meq.; noneffervescent; mildly alkaline (pH 7.7); vesicular pores; abrupt smooth boundary.
- C 1 6-15" Pale brown (10YR6/3) fine sandy loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, very friable, nonsticky, nonplastic; noneffervescent; gradual smooth boundary.
- C 2 15-36"+ Pale brown (10YR6/3) very fine sandy loam, brown (10YR4/3) moist; massive; soft, very friable, non-sticky, nonplastic; noneffervescent.

APPENDIX B-3

Coarse-loamy, mixed, mesic family of Typic Camborthids

These soils characteristically have a 4 to 7 inch thick light gray ochric epipedon and pale brown 7 to 12 inch thick cambic horizon. The solum is moderately alkaline.

These soils are usually found at elevations from 4750 to 5000 feet and are associated with the *Artemisia tridentata*/*Grayia spinosa*, *Sarcobatus baileyi*/*Atriplex confertifolia* and *S. baileyi*/*Chrysothamnus viscidiflorus* communities. They are found in drainage bottoms and on fans with northeast aspects of 1 to 5 percent slopes. The macrorelief is undulating or flat and microrelief is convex or uniform. These soils belong to the B hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 0 to 3.

- A 11 0-3" Light gray (10YR7/2) loam, dark yellowish brown (10YR4/4) moist; moderate medium platy; slightly hard, friable, sticky, plastic; organic matter 1.1 percent, conductivity 0.30 mmhos., cation exchange capacity 16.5 meq.; noneffervescent; moderately alkaline (pH 8.0); vesicular pores; abrupt smooth boundary.

APPENDIX B-3 (cont'd)

- | | | |
|------|---------|--|
| A 12 | 3-7" | Pale brown (10YR6/3) very fine sandy loam, brown (10YR4/3) moist; weak medium platy; slightly hard, very friable, slightly sticky, nonplastic, non-effervescent; abrupt smooth boundary. |
| B2* | 7-14" | Pale brown (10YR6/3) fine sandy loam, brown (10YR4/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; organic matter 0.8 percent, conductivity 0.60 mmhos.; very slightly effervescent; moderate alkaline (pH 8.1); gradual smooth boundary. |
| Clca | 14-31"+ | Very pale brown (10YR8/3) fine sandy loam, brown (10YR5/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; violently effervescent. |

* Cambic horizon

APPENDIX B-4

Loamy-skeletal, mixed, mesic family of Mollic Camborthids

These soils characteristically have a 6 to 7 inch thick light brownish gray ochric epipedon and a very pale brown 10 to 11 inch thick cambic horizon.

These soils are usually found at elevations from 5000 to 5050 feet and are associated with the *Grayia spinosa*/*Chrysothamnus viscidiflorus* and *Sarcobatus baileyi*/*Atriplex confertifolia*/*C. viscidiflorus* communities. They are found on northeast aspects with 1 to 8 percent slopes. The macrorelief is undulating and the microrelief is convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 2.

- | | | |
|------|------|--|
| A 11 | 0-4" | Light brownish gray (10YR6/2) very gravelly, fine sandy loam, dark brown (10YR3/3) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; organic matter 1.2 percent, conductivity 0.40 mmhos., cation exchange capacity 14.8 meq.; very slightly effervescent; moderately alkaline (pH 8.2); vesicular pores; abrupt smooth boundary. |
| A 12 | 4-7" | Very pale brown (10YR7/3) very gravelly fine sandy loam, dark brown (10YR3/3) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; slightly effervescent; clear smooth boundary. |

- B2* 7-12" Very pale brown (10YR7/3) very gravelly fine sandy loam, brown (10YR4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; organic matter 0.5 percent, conductivity 0.45 mmhos.; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
- Clca 12-28"+ Very pale brown (10YR7/3) very gravelly sandy loam, dark yellowish brown (10YR4/4) moist; massive; soft, very friable, nonsticky, nonplastic; violently effervescent.

*Cambic horizon

APPENDIX B-5

Loamy-skeletal, mixed, mesic family of Typic Haplargids

Typically these soils have a 4-inch pale brown ochric epipedon; a 9-inch brown, weak medium subangular blocky, gravelly sandy loam argillic horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 4800 feet and are associated with the *Artemisia tridentata/Bromus tectorum* (Low) community. They are found on east aspects of 8 percent slopes. The macrorelief is undulating and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 0.9 inches. Stoniness class is 4.

- A 1 0-4" Pale brown (10YR6/3) very gravelly sand, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; organic matter 0.8 percent, conductivity 0.20 mmhos., cation exchange capacity 9.0 meq.; very slightly effervescent; neutral (pH 6.8); vesicular pores; abrupt smooth boundary.
- B2* 4-11" Brown (10YR5/3) very gravelly sandy loam, dark brown (7.5YR3/2) moist; weak moderate subangular blocky; soft, very friable, slightly sticky, nonplastic; organic matter 0.6 percent, conductivity 0.15 mmhos.; very slightly effervescent; neutral (pH 7.0); abrupt smooth boundary.
- Cl 11-21"+ Pale brown (10YR6/3) very gravelly sand, dark brown (10YR3/3) moist; loose, loose, nonsticky, nonplastic; very slightly effervescent.

* Argillic horizon

Fine-loamy, mixed, mesic family of Typic Haplargids

These soils characteristically have a 6-inch light gray ochric epipedon, a light yellowish brown, moderate medium prismatic, clay B2t horizon. Reaction decreases with depth and ranges from moderately alkaline to neutral.

These soils are usually found at elevations from 4830 to 4900 feet and are associated with the *Sarcobatus baileyi*/*Artemisia spinescens* and *S. baileyi*/*Atriplex confertifolia* communities. They are found on fans of north and northwest aspects with 2 to 3 percent slopes. The macrorelief is flat to undulating and the microrelief is uniform or convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 1 to 3.

- | | | |
|------|---------|--|
| A1 | 0-6" | Light gray (10YR7/2) gravelly very fine sandy loam, brown (10YR5/3) moist; moderate medium platy; slightly hard, very friable, slightly sticky, nonplastic; conductivity 0.65 mmhos., cation exchange capacity 9.2 meq.; noneffervescent; moderately alkaline (pH 8.0); vesicular pores; abrupt smooth boundary. |
| B1* | 6-10" | Pale brown (10YR6/3) gravelly loam, dark yellowish brown (10YR4/4) moist; weak medium subangular blocky; slightly hard, very friable, sticky, plastic; non-effervescent; abrupt smooth boundary. |
| B2t* | 10-16" | Light brown (7.5YR6/4) clay, brown (7.5YR4/4) moist; moderate medium prismatic; hard, firm, very sticky, very plastic; organic matter 0.5 percent, conductivity 0.15 mmhos.; noneffervescent; neutral (pH 6.7); clay films; gradual smooth boundary. |
| B3* | 16-19" | Pink (7.5YR7/4) gravelly sandy loam, brown (7.5YR5/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; noneffervescent; abrupt smooth boundary. |
| C1 | 19-28"+ | Reddish yellow (7.5YR7/6) very gravelly sandy loam, brown (7.5YR4/4) moist; massive, soft, very friable, nonsticky, nonplastic; noneffervescent. |

* Argillic horizon

Fine, mixed, mesic family of Typic Haplargids

Typically these soils have a 5-inch pale brown ochric epipedon; a 24-inch light yellowish brown, subangular blocky, gravelly sandy clay loam to gravelly sandy clay argillic horizon. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4700 feet and are associated with the *Chrysothamnus viscidiflorus* community. They are found on southwest aspects with 2 percent slopes. The macrorelief is undulating and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.9 inches. Stoniness class is 0.

- | | | |
|------|---------|---|
| A1 | 0-5" | Pale brown (10YR6/3) gravelly sand, dark brown (10YR3/3) moist; massive; soft, very friable, nonsticky, nonplastic; organic matter 0.5, conductivity 0.10 mmhos., cation exchange capacity 7.5 meq.; very slightly effervescent; mildly alkaline (pH 7.4); abrupt smooth boundary. |
| B1* | 5-11" | Light yellowish brown (10YR6/4) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; weak medium subangular blocky; soft, friable, sticky, plastic; very slightly effervescent; abrupt smooth boundary. |
| B2t* | 11-29" | Light yellowish brown (10YR6/4) gravelly sandy clay, dark yellowish brown (10YR4/4) moist; moderate medium subangular blocky; slightly hard, firm, very sticky, plastic; organic matter 0.4 percent, conductivity 0.50 mmhos., very slightly effervescent; mildly alkaline (pH 7.5); clay films; gradual smooth boundary. |
| C1 | 29-38"+ | Pale brown (10YR6/3) loamy sand, dark yellowish brown (10YR3/4) moist; massive; soft, friable; nonsticky, nonplastic; very slightly effervescent. |

* Argillic horizon

APPENDIX B-8

Loamy-skeletal, mixed, mesic family of Lithic Haplargids

Typically these soils have a 5-inch pale brown ochric epipedon; a 12-inch thick argillic horizon and lithic contact within 17 inches. Reaction of the solum is neutral.

These soils are usually found at elevations around 4660 feet and are associated with the *Artemisia tridentata/Grayia spinosa* community. They are found on west aspects of 46 percent slopes. The macrorelief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.0 inches. Stoniness class is 4.

A 11	0-3"	Pale brown (10YR6/3) very gravelly sand, dark brown (10YR3/3) moist; weak fine granular; loose, loose, nonsticky, nonplastic; organic matter 0.9 percent, conductivity 0.15 mmhos., cation exchange capacity 11.8 meq.; slightly effervescent; neutral (pH 6.9).
A 12	3-5"	Pale brown (10YR6/3) very gravelly very fine sandy loam, dark yellowish brown (10YR3/4) moist; weak fine subangular blocky; soft, very friable, slightly sticky, nonplastic; slightly effervescent.
B2t*	5-12"	Pale brown (10YR6/3) very gravelly sandy loam, brown (10YR4/3) moist; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; organic matter 0.4 percent; conductivity 0.15 mmhos.; strongly effervescent; neutral (pH 7.3).
B3t*	12-17"	Very pale brown (10YR7/3) very gravelly very fine sandy loam, brown (10YR5/3) moist; weak fine subangular blocky; soft, very friable, slightly sticky, slightly plastic; violently effervescent.
R1	17"+	Bedrock

* Argillic horizon

Loamy-skeletal, mixed, frigid family of Lithic
Haplargids

These soils characteristically have a 6-inch ochric epipedon; a pale brown, massive, loamy 4-inch thick argillic horizon and lithic contact within 10 inches. Reaction increases with depth and ranges from slightly acid to neutral.

These soils are usually found at elevations around 5700 feet and are associated with the *Pinus monophylla/Juniperus osteosperma/Artemisia nova/Chrysothamnus nauseosus* community. They are found on east aspects of 17 percent slopes. The macrorelief is hilly and the microrelief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 0.9 inches.

A 11	0-3"	Light grayish brown (10YR6/2) very gravelly sand, very dark grayish brown (10YR3/2) moist; single grain; loose, loose, nonsticky, nonplastic; organic matter 0.9 percent, conductivity 0.15 mmhos., cation exchange capacity 6.0 meq.; noneffervescent; slightly acid (pH 6.2); abrupt smooth boundary.
A 12	3-6"	Light gray (10YR7/1) very gravelly sandy loam, brown (10YR5/3) moist; weak medium platy; soft, very friable, slightly sticky, slightly plastic; noneffervescent; vesicular pores; abrupt smooth boundary.
B2t*	6-10"	Pale brown (10YR6/3) very gravelly loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, friable, sticky, plastic; organic matter 0.8 percent, conductivity 0.15 mmhos.; noneffervescent; neutral (pH 6.8); clay films; abrupt wavy boundary.
R 1	10"+	Bedrock

* Argillic horizon

APPENDIX B-10

Clayey-skeletal, mixed, mesic family of Lithic Haplargids

These soils characteristically have a 3 1/2-inch light brownish gray ochric epipedon; a pale brown, subangular blocky, sandy clay argillic horizon and lithic contact within 8 inches. Reaction increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 4710 feet and are associated with the *Atriplex confertifolia*/*Artemisia spinescens* community. They are found on west aspects of 15 percent slopes. The macrorelief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 0.9 inches. Stoniness class is 4.

A 1	0-3½"	Light brownish gray (10YR6/2) very gravelly sandy clay loam, brown (10YR4/3) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; organic matter 0.7 percent, conductivity 0.35 mmhos., cation exchange capacity 13.8 meq.; very slightly effervescent; neutral (pH 7.2); vesicular pores; abrupt smooth boundary.
B2t*	3½-8"	Pale brown (10YR6/3) very gravelly sandy clay, brown (7.5YR4/4) moist; moderate medium subangular blocky; slightly hard, firm, very sticky, very plastic; organic matter 0.5 percent, conductivity 0.30 mmhos.; very slightly effervescent; mildly alkaline (pH 7.5); clay films; abrupt wavy boundary.
R1	8"+	Bedrock

* Argillic horizon

APPENDIX B-11

Clayey-skeletal, mixed, mesic family of Lithic Mollic Haplargids

Typically these soils have a 4-inch pale brown to light gray ochric epipedon; a 9-inch light yellowish brown, moderate fine subangular blocky, clay argillic horizon and lithic contact within 13 inches. Reaction of the solum is neutral.

APPENDIX B-11 (cont'd)

These soils are usually found at elevations around 4590 feet and are associated with the *Artemisia tridentata/Bromus tectorum* (Low) community. They are found on east aspects of 7 percent slopes. The macrorelief is undulating and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.3 inches. Stoniness class is 4.

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|------|-------|---|
| A 11 | 0-2½" | Pale brown (10YR6/3) very gravelly very fine sand, dark brown (10YR3/3) moist; single grain; loose, loose, nonsticky, nonplastic; organic matter 1.1 percent, conductivity 0.10 mmhos., cation exchange capacity 7.8 meq.; very slightly effervescent; neutral (pH 6.7); abrupt smooth boundary. |
| A 12 | 2½-4" | Light gray (10YR7/1) gravelly fine sandy loam, brown (10YR4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; very slightly effervescent; vesicular pores; abrupt smooth boundary. |
| B2t* | 4-13" | Light yellowish brown (10YR6/4) gravelly clay, dark yellowish brown (10YR4/4) moist; moderate fine sub-angular blocky; hard, firm, very sticky, very plastic; organic matter 0.8 percent, conductivity 0.20 mmhos.; very slightly effervescent; neutral (pH 6.8); clay films; abrupt wavy boundary. |
| R 1 | 13"+ | Bedrock |

* Argillic horizon

APPENDIX B-12

Loamy-skeletal, mixed, frigid family of Mollic Haplargids

These soils characteristically have a 9 to 14-inch ochric epipedon over a light yellowish brown, massive, gravelly sandy clay loam B2t horizon. Reaction increases with depth and ranges from strongly acid to neutral.

These soils are usually found at elevations from 5600 to 5900 feet and are associated with the *Pinus monophylla/Artemisia tridentata* community. They are found on east or northeast facing slopes of 4 to 5 percent. The macrorelief is undulating and the microrelief is uniform or convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 3.7 inches. Stoniness class is 0 to 3.

APPENDIX B-12 (cont'd)

A 11	0-3"	Light brownish gray (10YR6/2) gravelly sandy loam, dark brown (10YR3/3) moist; single grain; loose, nonsticky, nonplastic; organic matter 5.8 percent, conductivity 0.25 mmhos., cation exchange capacity 10.2 meq.; noneffervescent; strongly acid (pH 5.2); abrupt smooth boundary.
A 12	3-9"	Pale brown (10YR6/3) gravelly sandy loam, dark yellowish brown (10YR3/4) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; noneffervescent; clear smooth boundary.
B2t*	9-24"	Light yellowish brown (10YR6/4) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, sticky, slightly plastic; noneffervescent; organic matter 1.0 percent, conductivity 0.34 mmhos.; neutral (pH 6.6); clay films; gradual smooth boundary.
B3*	24-39"	Light yellowish brown (10YR6/4) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; noneffervescent; gradual smooth boundary.
C1	29-36"+	Very pale brown (10YR7/4) loamy sand, yellowish brown (10YR5/4) moist; massive; loose, nonsticky, nonplastic; noneffervescent.

* Argillic horizon

APPENDIX B-13

Fine-loamy, mixed, frigid family of Mollic Haplargids

Typically these soils have a 17-inch light brownish gray ochric epipedon, over a light yellowish brown, moderate medium prismatic, gravelly B2t horizon. Reaction increases with depth and ranges from slightly acid to neutral.

These soils are usually found at elevations around 5100 feet and are associated with the *Artemisia tridentata/Bromus tectorum* (High) community. They are found on east facing fans with 1 percent slope. The macrorelief is flat and the microrelief is uniform. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.6 inches. Stoniness class is 0.

APPENDIX B-13 (cont'd)

A 11	0-3"	Light brownish gray (10YR6/2) gravelly sand, dark brown (10YR3/3) moist; single grain; soft, loose, nonsticky, nonplastic; organic matter 1.6 percent, conductivity 0.15 mmhos., cation exchange capacity 8.8 meq.; noneffervescent; slightly acid (pH 6.3); abrupt smooth boundary.
A 12	3-17"	Light brownish gray (10YR6/2) gravelly sandy loam, dark brown (10YR3/3) moist; massive; soft, very friable, slightly sticky, nonplastic; noneffervescent; abrupt smooth boundary.
B2t*	17-26"	Light yellowish brown (10YR6/4) gravelly clay, brown (10YR4/3) moist; medium moderate prismatic; very hard, very firm, very sticky, very plastic; organic matter 0.7 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 6.8); clay films; clear smooth boundary.
B3*	26-34"	Very pale brown (10YR7/4) gravelly clay loam, dark yellowish brown (10YR4/4) moist; massive; hard, firm, sticky, plastic; noneffervescent; gradual smooth boundary.
C1	34-39"+	Very pale brown (10YR7/3) gravelly sandy loam, brown (10YR4/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; noneffervescent.

* Argillic horizon

APPENDIX B-14

Clayey-skeletal, mixed, frigid family of Mollic Haplargids

Typically these soils have a 7-inch ochric epipedon; over a pale brown, moderate medium prismatic, very gravelly clay B2t horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 5100 feet and associated with the *Artemisia nova/Bromus tectorum*/rock community. They are found on southwest facing slopes of 44 percent. The macro-relief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.7 inches. Stoniness class is 3.

A 11	0-2"	Light gray (10YR7/2) very gravelly sandy clay loam, brown (10YR4/3) moist; moderate medium platy; soft, very friable, sticky, plastic; organic matter 1.4
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APPENDIX B-14 (cont'd)

		percent, conductivity 0.37 mmhos., cation exchange capacity 37.0 meq.; noneffervescent; neutral (pH 6.2); vesicular pores; abrupt smooth boundary
A 12	2-7"	Light brownish gray (10YR6/2) very gravelly sandy clay loam, dark yellowish brown (10YR3/4) moist; massive; soft, very friable, sticky, plastic; non-effervescent; abrupt smooth boundary.
B2t*	7-20"	Pale brown (10YR6/3) very gravelly clay, dark brown (10YR3/3) moist; moderate medium prismatic; hard, friable, very sticky, very plastic; organic matter 1.3 percent; conductivity 0.30 mmhos.; noneffervescent; neutral (pH 6.7); clay films; gradual smooth boundary.
B3*	20-25"	Very pale brown (10YR8/4) gravelly loam, brown (10YR5/3) moist; massive; hard, friable, very sticky, very plastic; noneffervescent; abrupt wavy boundary.
C1	25-32'+	Light gray (2.5YR7/2) gravelly loam, light olive gray (5YR6/2) moist; massive; hard, friable, slightly sticky, plastic; noneffervescent; weathered shale.

* Argillic horizon

APPENDIX B-15

Fine, mixed, frigid family of Mollic Haplargids

These soils characteristically have a 4-to 6-inch ochric epipedon usually over a brown, strong medium prismatic, clay B2t horizon. Reaction increases with depth and ranges from slightly acid to neutral.

These soils are usually found at elevations from 4720 to 6100 feet and are associated with the *Artemisia nova/Bromus tectorum*/rock, *Chrysothamnus nauseosus/A. nova/B. tectorum*, *Pinus monophylla/Juniperus osteosperma/A. nova* and *Sisymbrium altissimum* communities. They are found on south, north, east and northeast facing slopes of 3 to 20 percent. The macrorelief is hilly or undulating and microrelief is convex or concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.4 inches. Stoniness class is 3 or 4.

A 11	0-2"	Pale brown (10YR6/3) gravelly silty loam, dark brown (10YR3/3) moist; single grain; soft, very friable, slightly sticky, slightly plastic; organic matter 1.4 percent, conductivity 0.35 mmhos., cation exchange
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		capacity 15.5 meq.; noneffervescent; slightly acid (pH 6.2); abrupt smooth boundary.
A 12	2-6"	Light gray (10YR7/2) gravelly silt loam, dark brown (10YR3/3) moist; moderate medium platy; slightly hard, very friable, slightly sticky, slightly plastic; non-effervescent; vesicular pores; abrupt smooth boundary.
B2t*	6-19"	Brown (10YR5/3) clay, very dark grayish brown (10YR3/2) moist; strong medium prismatic; very hard, very firm, very sticky, very plastic; organic matter 1.1 percent, conductivity 0.45 mmhos.; noneffervescent; neutral (pH 6.7); clay films; gradual smooth boundary.
B3*	19-29"	Very pale brown (10YR7/4) clay loam, brown (7.5YR4/4) moist; massive; slightly hard, friable, sticky, plastic; noneffervescent; gradual smooth boundary.
C1 _{ca}	29-37+"	Light yellowish brown (10YR6/4) gravelly loam, brown (7.5YR4/4) moist; massive; slightly hard, friable, sticky, plastic; violently effervescent.

* Argillic horizon

APPENDIX B-16

Loamy-skeletal, mixed, mesic family of Typic
Durargids

Typically these soils have a 3-inch light grayish brown ochric epipedon; a light yellowish brown, moderate medium subangular blocky, gravelly sandy clay loam B2t horizon and an indurated duripan within 21 inches of the surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations from 4585 to 4710 feet and are associated with the *Atriplex confertifolia*/*Artemisia spinescens* and *Tetradymia glabrata* communities. They are found on west or northwest facing slopes of 20 to 24 percent. The macrorelief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.2 inches. Stoniness class is 4.

APPENDIX B-16 (cont'd)

A 1	0-3"	Light brownish gray (10YR6/2) very gravelly sand, dark brown (10YR3/3) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; organic matter 1.0 percent, conductivity 0.40 mmhos., cation exchange capacity 15.8 meq.; very slightly effervescent; neutral (pH 7.2); vesicular pores.
B1*	3-7"	Pinkish gray (5YR6/2) gravelly sandy clay loam, dark reddish gray (5YR4/2) moist; weak moderate subangular blocky; soft, very friable, sticky, plastic; very slightly effervescent.
B2t*	7-13"	Light yellowish brown (5YR6/4) gravelly sandy clay loam, reddish brown (5YR4/4) moist; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; organic matter 0.4 percent, conductivity 0.10 mmhos.; very slightly effervescent; mildly alkaline (pH 7.7); clay films.
B3*	13-21"	Reddish brown (5YR6/6) very gravelly sandy loam, yellowish red (5YR4/6) moist; weak medium subangular blocky; slightly hard, friable, slightly sticky, nonplastic; very slightly effervescent.
C1casim	21"+	Indurated duripan

* Argillic horizon

APPENDIX B-17

Fine-loamy, mixed, mesic family of Typic Durargids

These soils characteristically have a 3 to 5-inch light brownish gray ochric epipedon over a pale brown, medium moderate prismatic, gravelly sandy clay loam B2t horizon and an indurated duripan within 15 inches of the surface. Reaction increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations from 4720 to 4900 feet and are associated with the *Tetradymia glabarata* and *Sarcobatus baileyi/Atriplex confertifolia* communities. They are found on east or northeast facing fans or slopes of 3 to 14 percent. The macrorelief is flat or hilly and the microrelief is uniform or concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.6 inches. Stoniness class is 4.

APPENDIX B-17 (cont'd)

A 1	0-3"	Light brownish gray (10YR6/2) very gravelly sandy loam, dark brown (10YR3/3) moist; granular, loose, soft, slightly sticky, nonplastic; organic matter 1.0 percent, conductivity 0.40 mmhos., cation exchange capacity 2.9 meq.; very slightly effervescent; neutral (pH 7.3); abrupt smooth boundary.
B2t*	3-10"	Pale brown (10YR6/3) gravelly sandy clay loam, brown (10YR4/3) moist; medium moderate prismatic; hard, friable, sticky, plastic; organic matter 1.2 percent; conductivity 0.35 mmhos.; very slightly effervescent; mildly alkaline (pH 7.4); clay films; abrupt smooth boundary.
B3 _{ca} *	10-15"	White (10YR8/2) loam, very pale brown (10YR7/3) moist; massive; soft, very friable, sticky, plastic, violently effervescent; abrupt smooth boundary.
C1casim	15'+	Indurated duripan

* Argillic horizon

APPENDIX B-18

Clayey-skeletal, mixed, mesic family of Typic
Durargids

These soils characteristically have a 4 to 5-inch light gray ochric epipedon over a light brown, medium moderate prismatic, gravelly clay B2t horizon and an indurated duripan within 11 inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations from 4780 to 5200 feet and are associated with the *Atriplex confertifolia* community. They are found on northeast facing slopes of 7 to 22 percent. The macrorelief is undulating or hilly and the microrelief is uniform or convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.3 inches. Stoniness class is 4.

A 1	0-5"	Light gray (10YR6/1) very gravelly fine sandy loam, dark grayish brown (10YR4/2) moist; weak medium platy; slightly hard, friable, slightly sticky, slightly plastic; organic matter 0.9 percent, conductivity 0.30 mmhos., cation exchange capacity 14.8 meq.; non-effervescent; neutral (pH 6.9); vesicular pores, abrupt smooth boundary.
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APPENDIX B-21

Fine, mixed, frigid family of Haplic Mollic Durargids

Typically these soils have a 6-inch light brownish gray ochric epipedon; a brown, strong medium prismatic clay B2t horizon and an indurated duripan within 14 inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 6100 feet and are associated with the *Pinus monophylla/Juniperus osteosperma/Artemisia nova/Chrysothamnus nauseosus* community. They are found on southeast aspects with 8 percent slopes. The microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.3 inches. Stoniness class is 4.

A 11	0-3"	Light brownish gray (10YR6/2) gravelly sandy clay loam, dark brown (10YR3/3) moist; moderate medium platy; slightly hard, very friable, sticky, plastic; organic matter 1.4 percent, conductivity 0.34 mmhos., cation exchange capacity 9.0 meq.; noneffervescent; neutral (pH 6.8); vesicular pores; abrupt smooth boundary.
A 12	3-6"	Light brownish gray (10YR6/2) gravelly sandy clay loam, dark brown (10YR3/3) moist; weak coarse platy; slightly hard, very friable, sticky, plastic, noneffervescent; abrupt smooth boundary.
B2t*	6-14"	Brown (7.4YR5/4) clay, dark yellowish brown (10YR3/4) moist; strong medium prismatic; very hard, very firm, very sticky, very plastic; organic matter 1.0 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 6.7); clay films, abrupt wavy boundary.
Cl _{slm}	14"+	Indurated duripan

* Argillic horizon

Fine-loamy, mixed, frigid family of Mollic Durargids

These soils characteristically have a 8-inch light gray ochric epipedon over a pale brown, moderate medium prismatic, clay B2t horizon; an indurated duripan within 29 inches of the surface. Reaction increases with depth and ranges from slightly acid to neutral.

These soils are usually found at elevations around 4780 feet and are associated with the *Chrysothamnus nauseosus/Artemisia nova/Bromus tectorum* community. They are found on east facing slopes of 4 percent. The macrorelief is undulating and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.6 inches. Stoniness class is 4.

A 11	0-5"	Light gray (10YR7/2) very gravelly fine sandy loam, brown (10YR4/3) moist; moderate medium platy; slightly hard, very friable, slightly sticky, nonplastic; organic matter 2.2 percent, conductivity 1.3 mmhos., cation exchange capacity 13.9 meq.; noneffervescent; slightly acid (pH 6.1); vesicular pores; abrupt smooth boundary.
A 12	5-8"	Light gray (10YR7/2) very gravelly fine sandy loam, brown (10YR4/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; noneffervescent; abrupt smooth boundary.
B2t*	8-20"	Pale brown (10YR6/3) clay, dark yellowish brown (10YR4/4) moist; moderate medium prismatic; hard, firm, very sticky, very plastic; organic matter 0.8 percent, conductivity 0.45 mmhos., noneffervescent; neutral (pH 7.0); clay films; gradual smooth boundary.
B3*	20-29"	Very pale brown (10YR7/4) loam, brown (7.5YR4/4) moist; massive; slightly hard, friable, sticky, plastic; noneffervescent; abrupt wavy boundary.
Cl _{casim}	29"+	Indurated duripan

* Argillic horizon

Fine, mixed, mesic family of Mollic Durargids

Typically these soils have a 6-inch light gray to light brownish gray ochric epipedon over a light reddish brown, strong medium prismatic, clay B2t horizon, an indurated duripan within 15 inches of the surface. Reaction increases with depth and ranges from slightly acid to moderately alkaline.

These soils are usually found at elevations around 4895 feet and are associated with the *Grayia spinosa*/*Artemisia nova*/*Stipa speciosa* community. They are found on northeast facing slopes of 8 percent. The macrorelief is undulating and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.3 inches. Stoniness class is 3.

A 11	0-2"	Light gray (10YR6/1) gravelly sandy loam, dark brown (10YR3/3) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; organic matter 1.5 percent, conductivity 2.0 mmhos., cation exchange capacity 14.2 meq.; noneffervescent; slightly acid (pH 6.5); vesicular pores; abrupt smooth boundary.
A 12	2-6"	Light brownish gray (10YR6/2) gravelly fine sandy loam, brown (10YR4/3) moist; medium moderate platy; soft, very friable, slightly sticky, nonplastic; noneffervescent; vesicular pores; abrupt smooth boundary.
B2t*	6-12"	Light reddish brown (5YR6/4) clay, dark reddish brown (5YR3/4) moist; strong medium prismatic; very hard, very firm, very sticky, very plastic; organic matter 0.4 percent, conductivity 0.25 mmhos.; noneffervescent; moderately alkaline (pH 8.0); clay films; gradual smooth boundary.
Cl _{si}	12-15"	Pink (7.5YR7/4) sandy loam, yellowish red (5YR5/6) moist; massive; hard, firm, slightly sticky, nonplastic; noneffervescent; gradual smooth boundary.
Cl _{sim}	15"+	Indurated duripan

* Argillic horizon

Fine, mixed, frigid family of Mollic Durargids

Characteristically these soils have a 10-inch light brownish gray ochric epipedons over a weak medium prismatic, clay B2t horizon; an indurated duripan within 27 inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 6320 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia nova* community. They are found on west facing slopes of 20 percent. The macrorelief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.4 inches. Stoniness class is 4.

A 11	0-4"	Light brownish gray (10YR6/2) very gravelly silty loam, dark brown (10YR3/3) moist; weak medium platy; slightly hard, very friable, slightly sticky, slightly plastic; organic matter 2.5 percent, conductivity 0.20 mmhos., cation exchange capacity 13.0 meq.; noneffervescent; neutral (pH 6.6); vesicular pores; abrupt smooth boundary.
A 12	4-10"	Light brownish gray (10YR6/2) gravelly silty loam, dark brown (10YR3/3) moist; weak medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; noneffervescent; abrupt smooth boundary.
B2t*	10-21"	Brown (10YR5/3) moist; clay; weak medium prismatic, hard, very firm, very sticky, very plastic; organic matter 1.2 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 6.7); clay films; gradual smooth boundary.
B3*	21-27"	Very pale brown (10YR7/4) clay loam, yellowish brown (10YR5/4) moist; massive; slightly hard, friable, sticky, plastic; noneffervescent; abrupt smooth boundary.
C1 _{sicam}	27"+	Indurated duripan

* Argillic horizon

Very-fine, mixed, frigid family of Mollic Durargids

Typically these soils have a 1 to 7-inch light gray to pinkish gray ochric epipedon over a light reddish brown, strong medium prismatic, clay B2t horizon and an indurated duripan within 17 inches of the surface. Reaction of the solum is slightly acid.

These soils are usually found at elevations from 4900 to 6400 feet and are associated with the *Artemisia nova/Bromus tectorum* Community. They are found on north, northeast or east facing fans with 1 to 2 percent slopes. The macrorelief is undulating and the microrelief is uniform or convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 3.

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| A 11 | 0-4" | Pinkish gray (7.5YR6/2) sandy clay loam, dark brown (7.5YR3/2) moist; weak moderate platy; slightly hard, friable, sticky, plastic; organic matter 1.8 percent, conductivity 0.35 mmhos., cation exchange capacity 15.2 meq.; noneffervescent; slightly acid (pH 6.1); vesicular pores, abrupt smooth boundary. |
| A 12 | 4-7" | Pinkish gray (7.5YR6/2) sandy clay loam, dark brown (7.5YR3/2) moist; weak medium granular; slightly hard, very friable, sticky, plastic; noneffervescent; abrupt smooth boundary. |
| B2t* | 7-17" | Light reddish brown (5YR6/4) clay, reddish brown (5YR4/4) moist; strong medium prismatic; hard, firm, very sticky, very plastic, organic matter 1.1 percent, conductivity 0.20 mmhos.; noneffervescent; slightly acid (pH 6.5); clay films; abrupt wavy boundary. |
| Cl _{sicam} | 17"+ | Indurated duripan |

* Argillic horizon

Fine, mixed, mesic family of Typic Natrargids

The A horizon has been eroded away leaving the pink, strong medium prismatic, clay natric horizon exposed. The high surface conductivity, high pH, and structure indicate that this is a non-saline-alkali soil. Reaction increases with depth and ranges from moderately alkaline to strongly alkaline.

These soils are usually found at elevations around 5300 feet and are associated with the *Sarcobatus vermiculatus* community. They are found on southwest facing slopes of 4 percent. The macrorelief is rolling and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 5.2 inches. Stoniness class is 1.

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| A 1 | 0- $\frac{1}{4}$ " | Very pale brown (10YR7/3) fine sandy loam, brown (10YR4/3) moist; single grain; loose, soft, slightly sticky, nonplastic; organic matter 1.0 percent, conductivity 20.0 mmhos., cation exchange capacity 21.2 meq.; slightly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary. |
| B2t* | $\frac{1}{4}$ -6" | Pink (7.5YR7/4) clay, brown (7.5YR4/4) moist; strong medium prismatic; hard, firm, very sticky, very plastic; organic matter 0.7 percent, conductivity 2.3 mmhos.; violently effervescent; strongly alkaline (pH 8.8); clay films; gradual smooth boundary. |
| C1 | 6-11" | Pink (7.5YR8/4) silt loam, brown (7.5YR5/4) moist; massive; hard, friable, slightly sticky, slightly plastic; slightly effervescent; weathered shale, gradual smooth boundary. |
| C2 | 11-28" | Pink (5YR7/4) fine gravelly clay loam, reddish brown (5YR3/3) moist; massive; slightly hard, friable, sticky, plastic; slightly effervescent; weathered shale. |

* Natric horizon

Fine, mixed, mesic family of Typic Nadurargids

These soils characteristically have a 2 to 7-inch ochric epipedon over a strong medium columnar, clay B2t horizon and an indurated duripan within 13 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations from 4800 to 4980 feet and are associated with the *Atriplex confertifolia*, *A. confertifolia/Artemisia spinescens*, *Sarcobatus baileyi/A. confertifolia*, and *S. baileyi/A. confertifolia/Artemisia nova* communities. They are found on southeast, southwest and northeast facing fans or slopes with 1 to 6 percent slopes. The macrorelief is undulating or flat and the microrelief is uniform or concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.3 inches. Stoniness class is 1 to 4.

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| A 1 | 0-2" | Light gray (10YR6/1) gravelly fine sandy loam, dark brown (10YR3/3) moist; weak fine platy; soft, very friable, slightly sticky, nonplastic; organic matter 1.1 percent, conductivity 0.25 mmhos., cation exchange capacity 19.8 meq.; noneffervescent; mildly alkaline (pH 7.6); abrupt smooth boundary. |
| B2t* | 2-11" | Reddish brown (5YR5/3) clay, reddish brown (5YR4/4) moist; strong medium columnar; hard, firm, very sticky, very plastic; organic matter 0.9 percent, conductivity 0.9 mmhos.; noneffervescent; mildly alkaline (pH 7.8); clay films; gradual smooth boundary. |
| B3* | 11-13" | Reddish yellow (5YR6/6) clay, yellowish red (5YR4/6) moist; strong medium columnar; hard, very firm, very sticky, very plastic; noneffervescent; clay films, abrupt wavy boundary. |
| C ₁ _{sim} | 13"+ | Indurated duripan |

*Argillic horizon

Very-fine, mixed, mesic family of Haplic Natrargids

These soils characteristically have a 4-inch very pale brown ochric epipedon over a moderate to strong medium prismatic, clay natric horizon and a weakly cemented duripan within 18 inches of the surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 4950 feet and are associated with the *Sarcobatus baileyi*/*Artemisia spinescens* community. They are found on north facing fans with 1 percent slopes. The macrorelief is flat and the microrelief is uniform. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.9 inches. Stoniness class is 2.

- | | | |
|---------------------|--------|--|
| A 1 | 0-4" | Very pale brown (10YR7/3) gravelly fine sandy clay loam, dark yellowish brown (10YR4/4) moist; moderate medium platy; soft, very friable, slightly sticky, slightly plastic; organic matter 0.7 percent, conductivity 0.15 mmhos., cation exchange capacity 10.0 meq.; noneffervescent; mildly alkaline (pH 7.4); vesicular pores; abrupt smooth boundary. |
| B21t* | 4-7" | Light reddish brown (5YR6/4) clay, reddish brown (5YR4/4) moist; moderate medium prismatic; slightly hard, friable, very sticky, very plastic; organic matter 0.6 percent, conductivity 0.15 mmhos.; noneffervescent; mildly alkaline (pH 7.7); clay films, abrupt smooth boundary. |
| B22t* | 7-15" | Reddish yellow (5YR6/6) clay, reddish brown (5YR4/4) moist; strong medium prismatic; hard, firm, very sticky, very plastic; noneffervescent; clay films, gradual smooth boundary. |
| B3 | 15-18" | Reddish yellow (7.5YR8/6) fine sandy loam, yellowish red (5YR4/8) moist; massive; soft, very friable, slightly sticky, nonplastic; noneffervescent; abrupt wavy boundary. |
| C2 _{sicam} | 18"+ | Weakly cemented duripan |

* Natric horizon

Fine, mixed, frigid family of Mollic Nadurargids

Typically these soils have a 5-inch light brownish gray ochric epipedon over a light reddish brown, strong medium columnar, clay B2t horizon and an indurated duripan within 23 inches of the surface. Reaction of the solum is neutral.

These soils are usually found associated with the *Artemisia nova/Bromus tectorum*/rock community. They are found on northeast facing slopes of 19 percent. The macrorelief is hilly and the micro-relief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.0 inches. Stoniness class is 3.

- | | | |
|-------------------|--------|---|
| A 1 | 0-5" | Light brownish gray (10YR6/2) very gravelly fine sandy loam, brown (10YR5/3) moist; weak moderate platy; soft, very friable, nonsticky, nonplastic; organic matter 1.0 percent, conductivity 0.25 mmhos., cation exchange capacity 13.2 meq.; noneffervescent; neutral (pH 6.8); vesicular pores; abrupt smooth boundary. |
| B2t* | 5-16" | Light reddish brown (10YR6/4) clay, dark reddish brown (5YR3/4) moist; strong medium columnar; hard, firm very sticky, very plastic; organic matter 1.0 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 7.0); gradual smooth boundary. |
| B3* | 16-23" | Pink (7.5YR7/4) clay, brown (7.5YR4/4) moist; massive; hard, friable, very sticky, very plastic; non-effervescent; abrupt smooth boundary. |
| Cl _{sim} | 23"+ | Indurated duripan |

* Natric horizon

Loamy-skeletal, mixed, mesic family of Fluventic
Haplaquolls

Characteristically these soils have a 13-inch mollic epipedon over a light brownish gray, massive, mottled, very gravelly sandy clay loam 11C1 horizon. Reaction of the solum is neutral.

These soils usually are found at elevations around 5500 feet and are associated with the *Carex* sp./*Juncus balticus* and *Artemisia tridentata*/*J. balticus* communities. They are found on southeast or northeast slopes of 3 to 4 percent. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.5 inches. Stoniness class is 1.

- A 11 0-6" Dark gray (10YR4/1) gravelly silt loam, black (10YR2/1) moist; weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; organic matter 10.7 percent, conductivity 0.35 mmhos., cation exchange capacity 24.8 meq.; noneffervescent; neutral (pH 6.6); clear smooth boundary.
- A 12 6-13" Gray (10YR5/1) very gravelly silt loam, very dark brown (10YR2/2) moist; weak fine granular; slightly hard, very friable, slightly sticky, nonplastic; noneffervescent; few mottles; abrupt smooth boundary.
- 11C1 13-39"+ Light brownish gray (2.5YR6/2) very gravelly sandy clay loam, dark grayish brown (2.5YR4/2) moist; massive, hard, firm, sticky, plastic; organic matter 0.9 percent, conductivity 0.5 mmhos.; noneffervescent; neutral (pH 7.0); mottles.

APPENDIX B-31

Coarse-loamy, mixed, mesic family of Cumulic
Haplaquolls

Typically these soils have a 27-inch mollic epipedon over a very pale brown C horizon with mottles in the lower mollic epipedon. Reaction of the solum is moderately alkaline.

These soils are usually found at elevations around 5800 feet and are associated with the *Carex* sp./*Juncus balticus* community. They are found on southeast facing slopes of 11 percent. The macrorelief is undulating and the microrelief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 5.6 inches. Stoniness class is 0.

- A 11 0-7" Gray (10YR5/1) gravelly silty loam, black (10YR2/1) moist; weak medium granular; soft, very friable, slightly sticky, slightly plastic; organic matter 6.8 percent, conductivity 0.6 mmhos., cation exchange capacity 23.5 meq.; noneffervescent; moderately alkaline (pH 8.3); abrupt smooth boundary.
- A 12 7-15" Dark gray (10YR4/1) fine sandy loam, black (10YR2/1) moist; weak medium granular; slightly hard, friable, slightly sticky, slightly plastic; noneffervescent; abrupt smooth boundary.
- A 13 15-27" Dark gray (10YR4/1) fine sandy loam, black (10YR2/1) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; noneffervescent; few mottles; gradual smooth boundary.
- C1 27-35"+ Very pale brown (10YR7/4) fine sandy loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; noneffervescent; mottles.

APPENDIX B-32

Loamy-skeletal, mixed, frigid family of Typic
Argixerolls

Characteristically these soils have a 5-inch mollic epipedon and a reddish brown, medium coarse prismatic, sandy clay B2t horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 6100 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata* community. They are found on southeast facing slopes of 18 percent. The macrorelief is hilly and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 3.

- A 1 0-5" Grayish brown (10YR5/2) gravelly fine sandy loam, very dark grayish brown (10YR3/2) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; organic matter 2.9 percent, conductivity 0.30 mmhos.; cation exchange capacity 22.6 meq.; noneffervescent; neutral (pH 6.6); abrupt smooth boundary.

- B2t* 5-12" Brown (10YR5/3) gravelly sandy clay, brown (10YR4/3) moist; moderate coarse prismatic; hard, firm, very sticky, very plastic; organic matter 1.2 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 7.1); clay films; clear smooth boundary.
- B3* 12-19" Light yellowish brown (10YR6/4) gravelly clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, sticky, plastic, noneffervescent; gradual smooth boundary.
- C1 19-30" Very pale brown (10YR8/4) gravelly sandy loam, yellowish brown (10YR5/4) moist; massive; slightly hard, friable, nonsticky, nonplastic, slightly effervescent.

APPENDIX B-33

Fine-loamy, mixed, frigid family of Typic Argi-erolls

Typically these soils have a 11 to 17-inch mollic epipedon and a pink, massive sandy clay B2t horizon. Reaction of the surface horizon is strongly acid.

These soils are usually found at elevations from 5600 to 6100 feet and are associated with the *Artemisia tridentata*/*Bromus tectorum* (High) and *Pinus monophylla* communities. They are found on northeast facing slopes and fans with 6 to 12 percent slope. The macrorelief is undulating and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 5.7 inches. Stoniness class is 0.

- A 1 0-11" Grayish brown (10YT5/2) sandy loam, very dark grayish brown (10YR3/2) moist; weak medium platy; soft, very friable, nonsticky, nonplastic; organic matter 5.2 percent, conductivity 0.20 mmhos., cation exchange capacity 11.2 meq.; noneffervescent; strongly acid (pH 5.4); vesicular pores; abrupt smooth boundary.
- B2t* 11-25" Pink (7.5YR7/4) sandy clay, dark reddish brown (5YR3/4) moist; massive; hard, firm, sticky, plastic; non-effervescent; clay films; gradual smooth boundary.
- B3t* 25-34" Reddish yellow (7.5YR7/6) sandy clay loam, reddish brown (5YR5/5) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; noneffervescent; gradual smooth boundary.

- C1 34-39"+ Reddish yellow (7.5YR8/6) sandy loam, brown (7.5YR4/4) moist; massive; soft, very friable, nonsticky, nonplastic, noneffervescent.

* Argillic horizon

APPENDIX B-34

Fine, mixed, frigid family of Typic Argixerolls

Typically these soils have a 1½ to 11-inch mollic epipedon over a grayish brown, medium moderate prismatic, sandy clay B2t horizon. Reaction increases with depth and ranges from medium acid to slightly acid.

These soils are usually found at elevations from 6175 to 7000 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*, *A. tridentata*/*P. monophylla*, *P. monophylla*/*A. tridentata* and *Bromus tectorum* communities. They are found on south, southeast and northeast facing slopes of 3 to 40 percent. The macro-relief is mountainous or rolling and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 5.2 inches. Stoniness class is 0 to 4.

- A 11 0-5" Grayish brown (10YR5/2) gravelly sandy loam, very dark brown (10YR2/2) moist; medium moderate platy; soft, very friable, nonsticky, nonplastic; organic matter 5.6 percent, conductivity 0.25 mmhos., cation exchange capacity 12.0 meq.; noneffervescent; medium acid (pH 5.9); vesicular pores; abrupt smooth boundary.
- A 12 5-11" Dark grayish (10YR4/2) gravelly sandy loam, very dark brown (10YR2/2) moist; weak medium subangular blocky; soft, very friable, slightly sticky, nonplastic; noneffervescent; abrupt smooth boundary.
- B2t* 11-28" Grayish brown (10YR5/2) gravelly sandy clay, dark brown (10YR3/3) moist; massive; hard, firm, very sticky, plastic; organic matter 2.0 percent, conductivity 0.20 mmhos.; noneffervescent; slightly acid (pH 6.3); clay films; abrupt clear boundary.
- B3* 28-33" Light yellowish brown (10YR6/4) gravelly sandy clay loam, dark brown (7.5YR4/4) moist; massive; slightly hard, friable, sticky, slightly plastic; noneffervescent; gradual smooth boundary.

- C1 33-38"+ Reddish yellow (7.5YR7/6) gravelly sandy loam, brown (7.5YR5/4) moist; massive, soft, very friable, non-sticky, nonplastic; noneffervescent.

* Argillic horizon

APPENDIX B-35

Very-fine, mixed, frigid family of Lithic Argixerolls

Typically these soils have a 4-inch grayish brown mollic epipedon over a light yellowish brown, moderate medium prismatic, gravelly clay B2t horizon and bedrock within 10 inches of the soil surface.

These soils are usually found at elevations around 7600 feet and are associated with the *Artemisia arbuscula/Poa secunda* community. They are found on northeast, east and west facing slopes of 5 percent. The macrorelief is mountainous and the microrelief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.3 inches. Stoniness class is 4.

- A 1 0-4" Grayish brown (10YR5/2) very gravelly sandy clay loam, dark brown (10YR3/3) moist; weak coarse platy; soft, very friable, sticky, slightly plastic; organic matter 4.7 percent, conductivity 0.15 mmhos., cation exchange capacity 14.2 meq.; noneffervescent; slightly acid (pH 6.2); vesicular pores; abrupt smooth boundary.
- B2t* 4-10" Light yellowish brown (10YR6/4) gravelly clay, dark yellowish brown (10YR4/4) moist; moderate medium prismatic; very hard, very firm, very sticky, very plastic; organic matter 2.4 percent, conductivity 0.20 mmhos.; noneffervescent; slightly acid (pH 6.2); clay films; gradual wavy boundary.
- R1 10"+ Bedrock

* Argillic horizon

APPENDIX B-36

Loamy-skeletal, mixed, frigid family of Pachic
Argixerolls

These soils characteristically have 27-inch mollic epipedons; weak coarse prismatic, very gravelly sandy clay loam B2t horizons. Reaction increases with depth and ranges from medium acid to neutral.

These soils are usually found at elevations around 5500 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata* community. They are found on southeast facing slopes of 21 percent. The macrorelief is hilly and the microrelief is concave. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.5 inches. Stoniness class is 2.

- A 11 0-3" Grayish brown (10YR5/2) gravelly sandy loam, very dark brown (10YR2/2) moist; single grain; loose, nonsticky, nonplastic; organic matter 3.4 percent, conductivity 0.20 mmhos., cation exchange capacity 6.5 meq.; non-effervescent; medium acid (pH 6.0); abrupt smooth boundary.
- A 12 3-11" Grayish brown (10YR5/2) very gravelly sandy loam, very dark grayish brown (10YR3/2) moist; weak coarse platy; soft, very friable, nonsticky, nonplastic, noneffervescent; abrupt smooth boundary.
- B2t* 11-27" Brown (10YR5/3) very gravelly sandy clay loam, dark brown (10YR3/3) moist; weak coarse prismatic; slightly hard, friable, sticky, slightly plastic; organic matter 1.2 percent, conductivity 0.20 mmhos.; noneffervescent; neutral (pH 6.7); few clay films; gradual smooth boundary.
- B3* 27-36" Pale brown (10YR6/3) very gravelly sandy loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, friable, slightly sticky, nonplastic; noneffervescent; gradual smooth boundary.
- C1 36-40"+ Pale brown (10YR6/3) very gravelly sandy loam, brown (10YR4/3) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent.

* Argillic horizon

Very fine, mixed, frigid family of Vertic Argixerolls

Typically these soils have a 20-inch mollic epipedon; a grayish brown, strong medium to coarse prismatic B2t horizon and cracks at some period in most years. Reaction of the solum is slightly acid.

These soils are usually found at elevations around 6900 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula* community. They are found on southeast facing slopes of 14 percent. The macrorelief is hilly and the microrelief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 7.0 inches. Stoniness class is 3.

- | | | |
|------------------|---------|--|
| A 1 | 0-2" | Grayish brown (10YR5/2) clay, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, very sticky, very plastic; organic matter 2.2 percent, conductivity 0.2 mmhos., cation exchange capacity 4.0 meq.; noneffervescent; slightly acid (pH 6.5); abrupt smooth boundary. |
| B2t* | 2-10" | Grayish brown (10YR5/2) clay, very dark grayish brown (10YR3/2) moist; strong medium prismatic; very hard, very firm, very sticky, very plastic; organic matter 1.6 percent, conductivity 0.25 mmhos.; noneffervescent; slightly acid (pH 6.4); clay films; abrupt smooth boundary. |
| B22t* | 10-22" | Grayish brown (10YR5/2) clay, dark brown (10YR3/3) moist; strong coarse prismatic; very hard, very firm, very sticky, very plastic; noneffervescent; clay films; gradual smooth boundary. |
| B3* | 22-31" | Pale brown (10YR6/3) clay, brown (10YR4/3) moist; massive; hard, firm, very sticky, very plastic; non-effervescent; gradual smooth boundary. |
| C1 _{ca} | 31-37"+ | Very pale brown (10YR7/4) clay, yellowish brown (10YR5/4) moist; massive; slightly hard; friable, very sticky, very plastic; violently effervescent. |

* Argillic horizon

APPENDIX B-38

Loamy-skeletal, mixed, frigid family of Lithic Haploxerolls

Typically these soils have a 9-inch yellowish brown mollic epipedon over bedrock. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 6975 feet and are associated with the *Pinus monophylla*/*Artemisia tridentata* community. They are found on southeast facing slopes of 51 percent. The macrorelief is hilly and the microrelief is concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 0.8 inches. Stoniness class is 4.

- | | | |
|------|------|--|
| A 11 | 0-5" | Yellowish brown (10YR5/4) very gravelly fine sandy loam, very dark grayish brown (10YR3/2) moist; weak medium granular; soft, very friable, nonsticky, nonplastic; organic matter 4.6 percent, conductivity 0.30 mmhos., cation exchange capacity 18.0 meq.; non-effervescent; neutral (pH 6.7); abrupt smooth boundary. |
| A 12 | 5-9" | Yellowish brown (10YR5/4) very gravelly fine sandy loam, very dark grayish brown (10YR3/2) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; abrupt irregular boundary. |
| R1 | 9"+ | Bedrock |

APPENDIX B-39

Coarse-loamy, mixed, frigid family of Entic Haploxerolls

These soils characteristically have a 5 to 18-inch mollic epipedon over a massive, very gravelly sandy loam C horizon. Reaction of the surface horizon is neutral.

These soils are usually found at elevations from 6000 to 7650 feet and are associated with the *Artemisia tridentata*/*Symphoricarpos vaccinioides*, *Cercocarpus ledifolius*/*A. tridentata*, *Pinus monophylla*, *P. monophylla*/*A. tridentata* and *P. monophylla*/*Symphoricarpos vaccinioides*/*A. tridentata* communities. They are found on northeast and southeast facing slopes of 6 to 52 percent. The macrorelief is hilly or mountainous and the microrelief is convex or concave. These soils belong to the B hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 0 to 4.

- A 11 0-7" Grayish brown (10YR5/2) gravelly sandy loam, very dark brown (10YR2/2) moist; weak coarse platy; soft, very friable, nonsticky, nonplastic; organic matter 4.3 percent, conductivity 0.15 mmhos., cation exchange capacity 16.5 meq.; noneffervescent; neutral (pH 6.8); vesicular pores; gradual smooth boundary.
- A 12 7-18" Grayish brown (10YR5/2) very gravelly sandy loam, very dark grayish brown (10YR3/2) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; gradual smooth boundary.
- C1 18-29" Light brownish gray (10YR6/2) very gravelly sandy loam, dark brown (10YR3/3) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; gradual smooth boundary.
- C2 29-37" Pale brown (10YR6/3) very gravelly sandy loam, brown (10YR4/3) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; abrupt wavy boundary.
- R1 37"+ Weathered granite

APPENDIX B-40

Loamy-skeletal, mixed, frigid family of Entic
Haploxerolls

Characteristically these soils have a 13-inch mollic epipedon over a pale brown, massive, very gravelly sandy loam, C1 horizon. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 5720 feet and are associated with the *Pinus monophylla* community. They are found on north facing slopes of 60 percent. The macrorelief is hilly and the microrelief is concave. These soils belong to the B hydrologic group and have a profile available water holding capacity of 4.9 inches. Stoniness class is 4.

- A 11 0-6" Dark gray (10YR4/1) very gravelly fine sandy loam, very dark gray (10YR3/1) moist; massive; soft, very friable, nonsticky, nonplastic; organic matter 10.5 percent, conductivity 0.30 mmhos., cation exchange capacity 16.5 meq.; noneffervescent; neutral (pH 6.6); abrupt smooth boundary.

- A 12 6-13" Brown (10YR5/3) very gravelly fine sandy loam, dark brown (10YR3/3) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; gradual smooth boundary.
- C1 13-60"+ Pale brown (10YR6/3) very gravelly sandy loam, brown (10YR4/3) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent.

APPENDIX B-41

Coarse-loamy, mixed, frigid family of Cumulic Haploxerolls

Typically these soils have a 20 to 23-inch mollic epipedon over a massive, fine sandy loam C horizon. Reaction of the surface horizon is slightly acid.

These soils are usually found at elevations from 5460 to 6350 feet and are associated with the *Pinus monophylla*, *Populus tremuloides*/*Artemisia tridentata* and *Populus fremontii*/*Salix geyeriana* communities. They are found on northeast or northwest facing slopes or drainage bottoms with 1 to 28 percent. The macrorelief is hilly and the micro-relief is concave. These soils belong to the B hydrologic group and have a profile available water holding capacity of 3.4 inches. Stoniness class is 0.

- A 11 0-9" Very dark grayish brown (10YR3/2) fine sandy loam, black (10YR2/1) moist; weak coarse platy; soft, very friable, nonsticky, nonplastic; organic matter 12.0 percent, conductivity 0.5 mmhos., cation exchange capacity 24.5 meq.; noneffervescent; slightly acid (pH 6.5); abrupt smooth boundary.
- A 12 9-20" Grayish brown (10YR5/2) fine sandy loam, very dark grayish brown (10YR3/2) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent; gradual smooth boundary.
- C1 20-34"+ Pale brown (10YR6/3) fine sandy loam, dark yellowish brown (10YR3/4) moist; massive; soft, very friable, nonsticky, nonplastic; noneffervescent.

CHURCHILL CANYON WATERSHED

VEGETATION MAPPING UNITS AND PRECIPITATION RECORDING STATIONS

Scale 1:31680

1 0.5 0 1 2 Miles

Precipitation Recording Stations

Legend

- Recorder
- ▲ Peak Flow Gauge
- Rain Can

Road

Legend

- ==== Unimproved Dirt

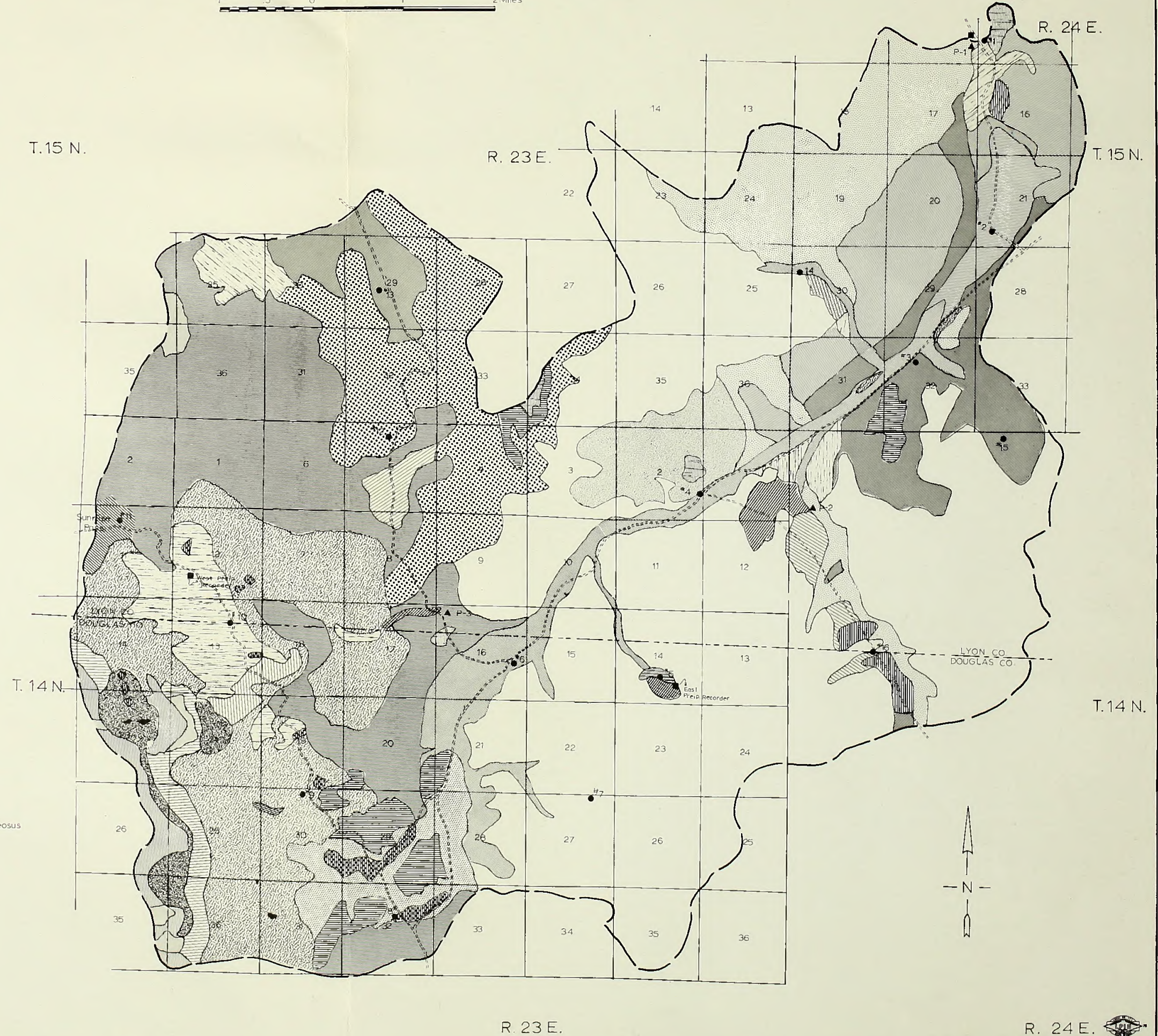
Vegetation Mapping Units

Legend

Symbol	%	
	100	Artemisia arbuscula/Poa secunda
	100	Artemisia nova/Bromus tectorum
	100	Artemisia nova/Bromus tectorum/Rock
	65	Artemisia nova/Bromus tectorum/Rock
	35	Artemisia nova/Bromus tectorum
	100	Artemisia tridentata/Bromus tectorum (Low)
	85	Artemisia tridentata/Bromus tectorum (High)
	15	Artemisia tridentata/Juncus balticus
	65	Artemisia tridentata/Dalea polyadenia
	25	Chrysothamnus viscidiflorus
	10	Dalea polyadenia
	100	Artemisia tridentata/Ephedra nevadensis
	70	Artemisia tridentata/Grayia spinosa
	30	Grayia spinosa/Chrysothamnus viscidiflorus
	100	Artemisia tridentata/Pinus monophylla
	100	Artemisia tridentata/Symphoricarpos vaccinioides
	100	Atriplex confertifolia
	100	Atriplex confertifolia/Artemisia spinescens
	100	Bromus tectorum
	100	Carex sp./Juncus balticus
	100	Cercocarpus ledifolius/Artemisia tridentata
	100	Chrysothamnus nauseosus/Artemisia nova/Bromus tectorum
	90	Ephedra nevadensis
	70	Ephedra nevadensis/Chrysothamnus viscidiflorus/Sarcobatus baileyi
	100	Eurotia lanata
	100	Grayia spinosa/Artemisia nova/Stipa speciosa
	100	Pinus monophylla
	100	Pinus monophylla/Artemisia tridentata
	100	Pinus monophylla/Symphoricarpos vaccinioides/Artemisia tridentata
	100	Pinus monophylla/Juniperus osteosperma/Artemisia arbuscula
	100	Pinus monophylla/Juniperus osteosperma/Artemisia nova
	100	Pinus monophylla/Juniperus osteosperma/Artemisia nova/Chrysothamnus nauseosus
	100	Pinus monophylla/Juniperus osteosperma/Artemisia tridentata
	100	Populus tremontii/Salix geyeriana
	100	Populus tremuloides/Artemisia tridentata
	100	Sarcobatus baileyi/Artemisia spinescens
	60	Sarcobatus baileyi/Atriplex confertifolia
	10	Sarcobatus baileyi/Atriplex confertifolia/Artemisia nova
	100	Sarcobatus baileyi/Atriplex confertifolia/Chrysothamnus viscidiflorus
	100	Sarcobatus baileyi/Chrysothamnus viscidiflorus
	100	Sarcobatus vermiculatus
	100	Tetradymia glabrata

The *Symmerium altissimum* Community is <7% of Any One Mapping Unit And is Not Noted on the Map.

Prepared by W. H. Blackburn 1968, Renewable Resources Center,
University of Nevada, From Bureau of Land Management Base Map.



R. 23 E.

R. 24 E.



APPENDIX C PLANT COMMUNITIES AND SOILS ASSOCIATION TABLE FOR CHURCHILL CANYON WATERSHED

	Torri- psam- ments	Torri- orth ents	Cambor- thids	Haplargids												Durargids										Natr- ar- gids	Nadurargids			Hapla- quolls	Argixerolls				Haploxerolls																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Plant Communities	Sandy, mixed, mesic, family of Typic Torripsamments	Course-loamy, mixed, mesic family of the Typic Torriorthents	Coarse-loamy, mixed, mesic family of Typic Camborthids	Loamy-skeletal, mixed, mesic family of Mollic Camborthids	Loamy-skeletal, mixed, mesic family of Typic Haplargids	Fine-loamy, mixed, mesic family of Typic Haplargids	Fine, mixed, mesic family of Typic Haplargids	Loamy-skeletal, mixed, mesic family of Lithic Haplargids	Loamy-skeletal, mixed, frigid family of Lithic Haplargids	Clayey-skeletal, mixed, mesic family of Lithic Haplargids	Clayey-skeletal, mixed, mesic family of Lithic Mollic Haplargids	Loamy-skeletal, mixed, frigid family of Mollic Haplargids	Fine-loamy, mixed, frigid family of Mollic Haplargids	Clayey-skeletal, mixed, frigid family of Mollic Haplargids	Fine, mixed, frigid family of Mollic Haplargids	Loamy-skeletal, mixed, mesic family of Typic Durargids	Fine-loamy, mixed, mesic family of Typic Durargids	Clayey-skeletal, mixed, mesic family of Typic Durargids	Fine, mixed, mesic family of Typic Durargids	Fine-loamy, mixed, mesic family of Haplic Durargids	Fine, mixed, frigid family of Haplic Mollic Durargids	Fine-loamy, mixed, frigid family of Mollic Durargids	Fine, mixed, mesic family of Mollic Durargids	Fine, mixed, frigid family of Mollic Durargids	Fine, mixed, frigid family of Mollic Durargids	Very-fine, mixed, frigid family of Mollic Durargids	Fine, mixed, mesic family of Typic Natrargids	Fine, mixed, mesic family of Typic Nadurargids	Very-fine, mixed, mesic family of Haplic Nadurargids	Fine, mixed, frigid family of Mollic Nadurargids	Loamy-skeletal, mixed, mesic family of Fluventic Haplaquolls	Coarse-loamy, mixed, mesic family of Cumulic Haplaquolls	Loamy-skeletal, mixed, frigid family of Typic Argixerolls	Fine-loamy, mixed, frigid family of Typic Argixerolls	Fine, mixed, frigid family of Typic Argixerolls	Very-fine, mixed, frigid family of Lithic Argixerolls	Loamy-skeletal, mixed, frigid family of Pachic Argixerolls	Very-fine, mixed, frigid family of Vertic Argixerolls	Loamy-skeletal, mixed, frigid family of Lithic Haploxerolls	Coarse-loamy, mixed, frigid family of Entic Haploxerolls	Loamy-skeletal, mixed, frigid family of Entic Haploxerolls	Coarse-loamy, mixed, frigid family of Cumulic Haploxerolls																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
<i>Artemisia arbuscula/ Poa secunda</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

APPENDIX C PLANT COMMUNITIES AND SOILS ASSOCIATION TABLE FOR CHURCHILL CANYON WATERSHED

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